FOUNDRY TRADE JOURNAL
EST. 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL
VOL. 98
No. 2016
APRIL 21, 1955
Registered at the G.P.O. as a Newspaper
Offices: John Adam House, John Adam St., London, W.C.2
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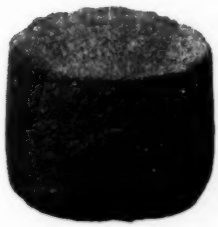

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Established 1902

Vol. 98 | Thursday, April 21, 1955 | No. 2016

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Published Weekly

Single copy 9d.; by post 11d.;
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Tied *versus* Independent

Recent information from America shows that the grey-iron jobbing foundries are enjoying a minor boom. Mr. Donald H. Workman, the executive vice-president of the Gray Iron Founders' Society, has forecast that production this year may rise to between 12 and 12.5 million (short) tons, as against 11.5 million tons last year. Yet the unattached foundries are not too happy about the situation, as they are experiencing increasing difficulty in competing with the tied shops. They will certainly benefit from the improved conditions but, according to one estimate, no less than 84 per cent. of the grey-iron foundry business is handled by the tied foundries as compared with 50 per cent. but a year ago. Since the end of the last war, the number of independent foundries, according to the *Wall Street Journal*, has shrunk from 1,342 to about 1,000; "last year alone, 130 shut their doors for good." One well-known concern, the Ferro Machine & Foundry, Inc., stopped the making of castings last October, but still operates its machine-shops. Production ceased because its major customers decided to make their own castings. The foundry previously cast about 500 tons of cylinder-blocks per day. Another foundry owner shut down his foundry because he could not meet the prices of the tied shops.

Theoretically, when a motor-car company envisages the making of 2,800 tons a day, it should be able to reduce manufacturing costs to a minimum. So far as this country is concerned, however, because of the overheads to be carried, production costs still favour the independent founders, but as overheads are internal matters, they can be changed at the whim of the board or one of its officers. Most of this trouble in the States seems to be confined to the automobile casting industry but there is a tendency for it to spread to others, as they, too, believe they can manufacture castings cheaper than they can buy.

The question arises as to whether such conditions will reach this country. One of the great motor-car companies has announced very large extensions to its foundries and as a result there will obviously be a serious curtailment of orders placed to independent foundries. Many years ago, we wrote in this column an article carrying the caption "Beware of the One Big Customer." What we then wrote applies with equal force to-day. Every independent foundry should make strenuous endeavours to have a large number of customers from widely-separated industries, so that the loss of one or more will not seriously affect output. A second policy for the independent founders is to extend their activities to embrace finished goods, as is done by such a high percentage of the industry.

G

Correspondence

CUPOLAS IN STEELWORKS PRACTICE

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—I have unfortunately only just had an opportunity to study the interesting article published in your JOURNAL on March 3, entitled "Cupolas in Steelworks Practice," which seemed to be based on a French review of published information.

The article implies that the technique of feeding open-hearth furnaces with hot metal from cupolas is being studied and that one or two experimental runs have been made. When I was in Germany recently, I found that the art there has progressed far beyond that stage as at least two plants are in continuous operation and several more are in course of erection.

One plant at Hansche Werke, Grossenbaum, started experimentally at the beginning of 1954 and has been working steadily since June of that year. The equipment consists of a 12 tons per hr. recuperative hot-blast cupola feeding two 100-ton open-hearth furnaces. The use of hot metal has resulted in a 10 per cent. saving on the cost of the liquid steel plus an increase in production from 8 to 11 tons per hr.

In contradistinction to the information in the article in your JOURNAL, no effort is made to reduce the carbon content of the cupola iron by increasing the silicon, but a low-silicon, low-manganese, low-sulphur iron is supplied to the open-hearth as it is found easier to remove the carbon in the open-hearth than to remove the silicon and manganese.

Interesting experiments have also been made with the products of steel from this hot-blast cupola iron by blowing it with oxygen. It would seem that this method might form the basis of a new low-cost method for steel production, particularly for small steel foundries.—Yours, etc.,

F. C. EVANS,
Joint managing director.
Metallurgical Engineers, Limited.

French Foundry Congress

The annual meeting of the *Association Technique de Fonderie* is to be held from June 2 to 4 next at 2 rue de Bassano, Paris 16. Mr. Gustave Rivoire is to preside. The following programme has been arranged:

Thursday, June 2

8.30 a.m. Registration. 9.00 a.m. Opening Address. 9.15 a.m. "Development of Shell Moulding at Watertown Arsenal from 1951 to the end of 1954" by Mr. J. F. Wallace and Mr. G. J. Snider (American Exchange Paper). 9.55 a.m. "Use of Silicones in Stripping Agents for Shell Moulds," by Mr. M. Borel. 10.35 a.m. A film display showing the commercial uses of silicones. 11.10 a.m. "Pre-coated Resin Sands for Shell Moulding" by Mr. J. Girard.

At 2.30 p.m. "The Future for Castings" by Mr. J. Léonard. 3.10 p.m. "Some High-strength Casting for Diesel Engines" by C. R. Van der Ben (British Exchange Paper). 3.50 p.m. "Contribution to the Study of Gases on the Structure of Iron" by Mr. G. Blanc and Mr. N. Volianik. 4.30 p.m. "Influence of Phosphorus on the Casting Properties and on the Structure of Grey Iron" by Mr. M. Ferry. 5.10 p.m. "A Short Study of the Elastic and Mechanical Properties of Grey Irons to Include the Nodular Varieties" by Mr. R. de Fleury.

Friday, June 3

Tour No. 1. Leave Rue de Bassano at 8 a.m. for the following works visits: Meury sur Loire (malleable and grey iron); Orleans (light alloys). (Luncheon en route). *Tour No.* 2. Leave Rue de Bassano at 8.30 a.m. for the Renault Automobile Works. Leave Rue de Bassano at 2.30 p.m. for the Société Industrielle de Fonderie d'Aluminium.

Saturday, June 4

9 a.m. "Some Notes on Casting under Load (pressure?)" by Mr. L. Grand. 9.40 a.m. "Development of the Technique for the making of Pressure-cast Light alloy Patterns in Plaster Moulds" by Mr. L. Marotine. 10.20 a.m. "Problems of Melting Hearths in the Siemens-Martin Furnace" by Dr. F. Roll (German Exchange Paper). 11.0 a.m. "Refinements in Cupola Practice" by Mr. J. G. Millamon.

In the afternoon at 2.30 p.m. "Measuring the Permeability of Sands" by Mr. M. Walter. 3.10 p.m. "Rational Use of Fuel Oil in Foundry Practice" by Mr. G. Ulmer. 3.50 p.m. A film dealing with the Hot-blast Cupola. 4.20 p.m. A film showing the processes used at the Pont à Mousson works. 5.15 p.m. Closing speeches. 8.0 p.m. Annual dinner followed by dancing.

IVE Spring Meeting

Visits to South Wales Steelworks

By courtesy of the directors of the company, members of the Institute of Vitreous Enamellers are invited to steelworks at Port Talbot, Llanelly and Velindre on Thursday and Friday, May 19 and 20. In conjunction with these visits, a social programme has been arranged, with headquarters at the Seabank Hotel, Porthcawl, at which members' ladies will be welcome. A special excursion has been arranged for the ladies to the Welsh Folk Museum at St. Fagan's near Cardiff on May 20.

Any member who is interested in taking part in these visits is requested to return a reply form to the secretary of the Institute as soon as possible and in no case later than May 6, 1955. The detailed programme is given below and members should make particular note of the transport arrangements.

Thursday, May 19

Coaches will depart from the Seabank Hotel, Porthcawl, at 12 noon for luncheon at the Grand Hotel, Port Talbot, by invitation of the company. After luncheon, visits will be made to the Margam and Abbey works where tea will be provided by the company before return to Porthcawl for approximately 5.30 p.m. (Members can join the party at Port Talbot, where transport will be available to convey any ladies direct to Porthcawl.)

In the evening there will be a dinner party, followed by a visit to the Pavilion Theatre, Porthcawl, for a performance of "The Master of Arts" by the Cardiff Little Theatre. (Members and ladies.)

(Ladies: afternoon free.)

Friday, May 20.

Coaches will depart from the Seabank Hotel at 9.00 a.m. for Llanelly to visit the Trostre Works in the morning. After luncheon, to be provided by the company, the party will proceed to Velindre to see the new works in course of construction before return to Porthcawl at approximately 5.00 p.m.

In the evening there will be a dinner at the Seabank Hotel at 7.30 p.m., followed by dancing until 1.00 a.m.

Ladies: Coaches will depart from the Seabank Hotel at 10.00 a.m. to visit the Welsh Folk Museum, where luncheon will be taken at 1.00 p.m. After luncheon, a further tour of the museum will be made before departing at 3.00 p.m., returning to Porthcawl for approximately 4.30 p.m.

Re-designing of Steel Castings to Ensure Soundness and Reduce Costs*

By T. Hurst, C.G.I.A.

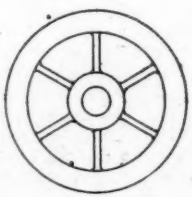
[*Abridged*]

The Author poses the question "Does the design of a steel casting affect its soundness?" and answers it in the affirmative by means of examples drawn from railway, rolling-mill, and general-engineering practice. Throughout, stress is laid on the importance of fullest co-operation between designer and foundryman in order to ensure that the making of steel castings is a technological discipline by adjusting the objectives of the one to the facilities and techniques of the other.

Designer/Producer Relationship

The casting of metals in their various forms is one of the oldest and truly basic of operations, and the trade secrets of a relatively few artisans in the past are gradually being broken down and reduced to a science in order to meet the increasingly high standard required by the consumer. In the past, co-operation has been lacking. The designer and founder have each gone their separate ways, in ignorance of each other's problems. The designer probably considered that molten metal would flow satisfactorily into any shape for which it was practicable to make a mould, and the founder accepted any design without query, lest he should be thought incompetent.

This unquestioning acceptance of faulty designs by the foundryman is probably the main reason why many designs reach the foundry floor which



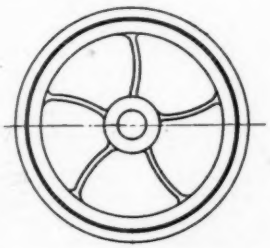


FIG. 1 (*left and centre*).—*Old-fashioned and badly designed flywheel.* FIG. 2.—*Flanged colliery wheel, an example of good design for casting in steel.*

are only castable with difficulty and considerable cost. Obviously, the designer would keep on submitting the same design if the founder did not complain, so it would appear that the founder is largely to blame for the lack of co-operation. Although numerous articles and papers have been presented on the subject they have in the main been confined to casting producers.

All the opportunities now existing for the exchange of ideas are resulting in the establishment of accepted principles of steel-casting design which help to overcome the varied faults, and it is on these principles that the designer should base his plans in order to obtain a sound product.

Solidification and Contraction

It is essential that the designer should have a basic knowledge of what occurs when steel progressively alters from molten to solid, and the contraction that takes place after solidification is complete, because it is during these two phases that good and bad design can have the most effect. The amount per foot by which a casting contracts or shrinks varies according to the metal used. As is generally known, steel has a greater contraction than cast iron because it is lower in carbon. It is therefore more prone to contraction troubles. The stress that is produced by contraction necessarily becomes greater as the characteristics of the liquid metal cause an increase in the degree of contraction, so correspondingly steel castings require more design control than most other metals, if for no other reason than this.

It may be surprising to the engineer to know that there are only three basic principles to be observed by him in order to obtain sounder castings. These are:—

(1) Equalization of metal thicknesses where possible; (2) avoidance of sharp corners at member junctions, and (3) directional solidification of the steel.

Design

Research carried out on steel castings over the past few years has revealed many important points

* Paper read before the Tee-side branch of the Institute of British Foundrymen, Mr. C. H. Wilson presiding.

and discovered the reasons for many of the faults which caused failures, but the real reason for these faults in many cases is the outmoded casting design. Many of the articles which are causing so much trouble through hot-tearing are fashioned after their cast-iron counterparts and the shape of many steel castings to-day demonstrates striking disregard or ignorance of the principles of design now known to be sound.

Take the case of the old-fashioned flywheel, Fig. 1, which is a typical example of any wheel having a heavy outer rim and boss joined by lighter-section radial arms. Any casting of this type is liable to develop hot-tears simply due to the uneven rate of contraction. The design is old-fashioned and the sections badly balanced, if it is to be made in steel. On the other hand the curved spokes of a colliery wheel, Fig. 2, is a good illustration of correct designing to overcome the stresses set up during the cooling of a casting. These arms will tend to straighten slightly when a tensile stress is applied by the contraction of the casting, thereby off-setting the danger of any cracking at the junction of the arms and the centre boss and the arms and rim.

Another point to be made concerning the design of wheels is the advantage of an odd number of spokes over an even number. A wheel having odd spokes will not have the same direct tensile stress along the arms as one having an even number but will have more resiliency to casting stresses.

These illustrations are established and elementary examples shown to foundry apprentices and students to illustrate the hazards of having separate bodies of metals joined together by arms or webs with the more-than-probable loss of the casting due to fractures. If the designer considers the points made, a wheel becomes an easy and trouble-free casting to produce, but for some reason he still continues to submit designs of the straight-arm and even-number-spoked variety. It could be that the foundryman has not previously made himself clear as to why he prefers odd-numbered or curved spokes in order to obtain a sound casting. It could also be that the wheel under load will be stronger with an even number of straight spokes, or is better balanced, although it seems doubtful.

Locomotive Wheel-centres

One designer has had the courage and confidence to alter radically the design of a locomotive wheel-centre. Fig. 3(*a*) is an example of a steel casting which has apparently been modelled after that of an iron casting, whilst Fig. 3(*b*) shows the wheel-centre re-designed, suitable for casting in steel.

In this case, the iron centres formerly used in building steam locomotives had very heavy sections where the axles and cranks were attached. Massive structure at these points was essential because of the severe complex stresses imposed in service and the comparatively low resistance to such stresses offered by grey iron. Resorting to steel for the manufacture of the wheel became obligatory when the weights and speeds of later trains began to be increased, but the relative degree of massiveness in those parts was not substantially changed. In the new design, which is Australian, the wheel is much lighter and it is claimed that it provides a higher strength : weight ratio than the old. The spokes are of a hollow U-shaped section and, as will be seen in Fig. 3 (*b*), metal has been removed at the intersection of the boss and arms, thus reducing appreciably the danger of hot-spots at the junctions.

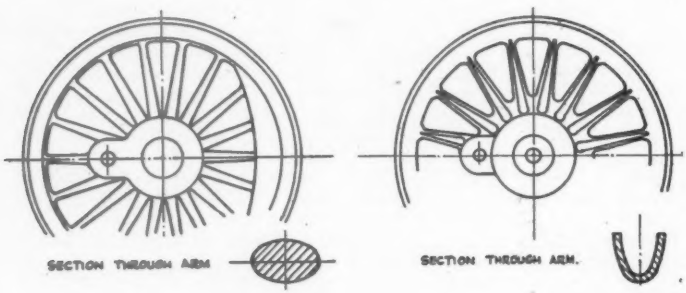


FIG. 3 (*a*) (*left*).—*Locomotive wheel-centre, apparently designed in the manner of an iron casting; (b) re-designed wheel centre suitable for cast-in steel.*

The designer's first consideration obviously was the saving of weight when re-designing, and not primarily the production of a sound casting, but it is apparent that the job was re-designed in conjunction with a foundryman, and the reduction was made in such a way as to produce a better casting than the old type.

Centre-filler Castings

An example is quoted of the centre-filler castings, Fig. 4, which is the result of careful co-operation between the designer and production staffs concerned. These castings now replace a welded-plate design consisting of 17 parts, requiring 672 in. of weld, and weighing 306 lb. As an alternative to this costly and complicated fabrication, a foundry started experimenting, and developed what is now known as the three-piece centre-filler. This re-designed unit is made up of three castings, which are welded together and processed for delivery as one unit. This assembly

weighs only 205 lb., thus saving approximately 30 per cent., which is a very important factor to railway builders in their endeavour to lighten their rolling stock. It also requires only 34 in. of welding as against the original 672 in., which is a great saving in terms of cost. This interest on the part of the foundry resulted in the customer receiving a product superior in service, at a lower cost than the all-fabricated counterpart.

Two more castings in the railway field are the side-frames and bolsters of wagon bogie-frames

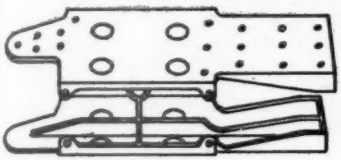


FIG. 4.—*Cast centre-filler requiring three components as compared with* 17 *when the item was produced as a weldment.*

which are also good examples of modern re-designing to incorporate the best features of equalized sections, clean lines and good appearance. Whilst the saving in weight is of great importance in this class of work, it must not be carried to extremes. Nevertheless, it is often the case that steel castings would be better if some sections were reduced in thickness to the equal of adjoining members, thereby increasing the soundness at the junctions. Saving in weight, however, must be consistent with good foundry practice.

Inspection

Over the past three or four years, there has been a steady trend towards the adoption of larger steel castings. Rolling mills and press shops are requiring castings of a size not visualized a comparatively short time ago, and now the founder is frequently asked to quote for cylinders, cross-heads, main-frames, roll-housings, etc., to the utmost limit of plant capacity. Castings in this category in the region of 50 tons each are now the accepted order of the day, whilst one firm recently delivered a casting of the colossal weight of 186 tons. Obviously the cost of any of this type of job would be thousands of pounds, and it is easy to understand the founder's concern if there are any limitations in the design and why he is becoming more and more critical and insistent on sound designing practice. A "waster" in this size range cannot be contemplated, and consequently the founder is careful to approach the customer and discuss any possible alterations before commencing production.

Before some high-duty castings are delivered, rigorous inspections are carried out, both visual and non-visual, such as X-ray, gamma-ray, magnetic crack detecting, and to a minor degree ultrasonic testing—in addition to the usual physical tests on test-bars. As these testing aids become used more and more at the customer's request, it becomes increasingly important from the foundry point of view that the design is compatible. In other words, it hardly seems relevant to test a doubtful concentration of metal by X-ray or ultrasonic methods when the founder would be suspicious anyway of the soundness of the section without the tests being made. Not only would the faults of the casting be exposed, but also the faults of the design at a stage when it was too late to re-design. Therefore, the co-operation between designer and founder is essential at drawing-board stage, with, in many cases, the help of a model to illustrate the possible danger spots.

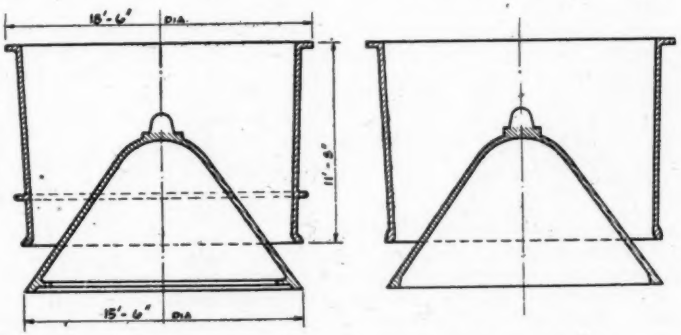


FIG. 5.—*Examples of* (*a*) (*left*) *old design and* (*b*) *good re-design as a steel casting of blast-furnace charging bells and hoppers.*

Examples of Good Re-designing

Recent examples of the need for re-designing are given in the case of the blast-furnace bells and hoppers shown in Figs. 5 (*a*) and (*b*). The hoppers are approximately 18 ft. dia. over the flanges, rising to a height of 11 ft. 8 in. These castings were previously made in iron. On changing over to cast steel for the material, hot-tears developed, due to the presence of an external flange 1 ft. 8 in. above the base of the hopper and an internal flange round the bell, both of which resisted the free contraction of the castings. The contraction in depth of the hopper betweeen the flanges is approximately 2 in. and owing to the resistance of the shoulder of sand the casting tore immediately above the flange. These flanges had no obvious function and seemed superfluous to the founder. On enquiry,

Re-designing of Steel Castings

the customer elicited the information that they were there to give added strength to the castings. The founder immediately pointed out the adverse effect which they were having and recommended their omission. His suggestion was accepted in the case of the hopper, together with a modification of the half-round beading at the bottom which was, to a lesser degree, a source of danger. This was gradually blended in to the vertical wall as shown in Fig. 5 (*b*) instead of being a definite change of

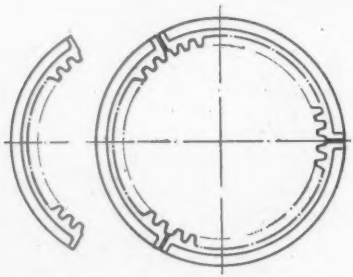


FIG. 6.—*Gearwheel of diameter 6 ft., having internal teeth and desired cast in three sections.*

section. The bell flange was also omitted, but the metal displaced was incorporated as extra thickness behind the point of contact with the hopper when in the closed position. This alternative increased the danger of contraction cavities but eliminated the greater danger of hot-tearing.

Both these castings take in the region of 2,000 man/hours to produce and are in regular demand. By the acceptance of the modifications suggested a large proportion of the element of risk has been removed.

Three-section Gearwheel

A further example of re-designing is given in the example of an internal-toothed gearwheel (Fig. 6), approximately 6 ft. dia., which was required cast in three segments, and provided with lugs through which would pass bolts for the final assembly of the item as a complete ring.

It was pointed out to the customer that, owing to the segments being different castings, it was quite possible that there would be differences in contraction and a tendency for the segments to hold out, or contract towards their common centre, thus giving a flattened effect which would need setting in order to form a true arc. It was suggested that the whole should be cast as a complete ring and sawn apart after heat-treatment—a proposal readily agreed to. By so doing, the danger of different casting stresses which may have been present in three separate castings was eliminated.

A hypothetical casting has been sketched in Fig. 7 which illustrates the manner in which the sections influence the ultimate soundness of a casting. This is followed by an illustration (Fig. 8) of a recent production job—the re-designing of a main cylinder housing in order to conform to the principles of good designing practice.

In the first case (Fig. 7), the casting is represented by the sections A1 and A2, B1 and B2, and C1 and C2, and the feeder heads by X and Y. In cooling, A2 is fed by the heavier section A1 above, which in turn receives liquid metal from the head X. The sections B1 and B2, due to their lightness, cool almost immediately and require no feeding. The location of the heavy section C2, below the lighter C1 has its supply of feed metal shut out by the quicker freezing of section C1, and the provision of feeding steel in riser Y is ineffective because C1, being lighter than C2, solidifies before the latter, resulting in a shrinkage cavity at D. To remedy this, it is necessary to increase the section C1 until it is equal in size or even larger than C2.

The cylinder housing (Fig. 8) is in general a practical application of the foregoing illustration, and its re-design was agreed upon after recommendations were suggested by the foundry concerned. This casting weighed 21 tons and involved approximately 1,000 man hours to produce from commencement to delivery, so every precaution had to be taken at the outset.

It was necessary, owing to its general shape, to cast it in the manner shown but there were various limitations from a solid feeding point of view, due to ill-balanced sections, and in places relatively sharp corners. Fig. 8 (*a*) and (*b*) shows this casting as it was first designed, and Fig. 8 (*c*) is of the same casting after practical re-designing. In (*a*) and (*b*), as will clearly be seen, the thickness of the bottom flange was not in keeping with the vertical walls, and if left as drawn would have resulted in contraction cavities being present in the flange. On the right hand side of the sketch (*b*), the clearance

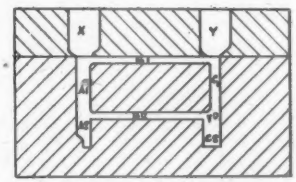


FIG. 7.—*Section through the mould for a hypothetical casting to illustrate the importance of sectional thickness.*

chamber in the vertical bore was characterized by too small a fillet in the corner joining the metal between the two different diameters.

It was agreed to reduce the thickness of the bottom flange, which had no purpose except to form lateral stiffness between the vertical columns, and also to incorporate a tapered thickness which increased as it reached the vertical wall. This wall in turn was increased in thickness until it was greater than the flange. On reaching the metal surrounding the 5 ft. 1 in. bore dia., this was blended to the original line. An improvement would have been made if it had carried through in a straight line, but having achieved the object of directional solidifica-

tion from the bottom flange, it was pointless to add needlessly to the weight of the casting. The corners of the pillar core were deleted and a fairly large chamfer between the two diameters was introduced instead, to eliminate any external hot-tearing. This method was also followed in the corners of the 5 ft. 6 in. dia. core.

It is not the foundryman's function to alter radically any design submitted, but to suggest any modifications necessary to the designer, in order to prevent any repetition of castings breaking down in service. The latter has undoubtedly occurred due to faulty design. Also it is desired to reach the designers of many smaller industries who may not appreciate the difficulties owing to their infrequent need for a steel casting. The foundryman's function is to suggest a trimming here and there of the main design, and that is often all that is needed to ensure a sound casting.

Re-designing to Reduce Costs

It was stated at the beginning of this Paper that the casting of steel is gradually becoming a science, but castings are not made for academic reasons, but for sale. A founder must produce good castings at an economical price in order to meet the very fierce competition both at home and abroad, and he is continually searching for easier and quicker methods of achieving this object.

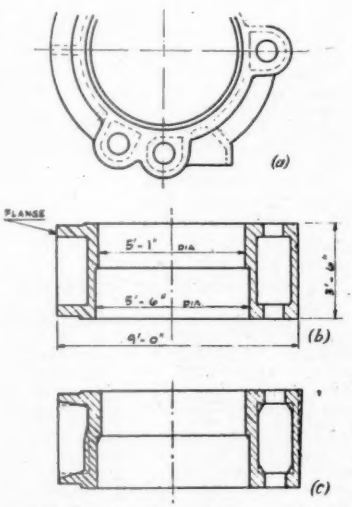


FIG. 8.—*Cylinder housing re-designed following the precepts enunciated in respect to Fig. 7; (a) and (b) original design, and (c) the same job radically modified to aid casting soundness.*

The designer can help tremendously towards this end, whether he is the customer's employee, or the manufacturer's. However, it is essential that he shall have a knowledge of patternmaking, moulding and closing operations, in order to be able to eliminate the time wastage caused by badly proportioned ribs, flanges, etc., as little can be done with poor or "impossible" designs, no matter what ingenuity and experience the foundryman may have. There is much that the designer can do to improve the outline of a casting to make it a better mould-proposition and a cheaper product by the elimination of loose-pieces on the pattern and outside cores. Horizontal bands of steel running round a casting look very impressive and may appear to give the part added strength (very often it is the reverse),

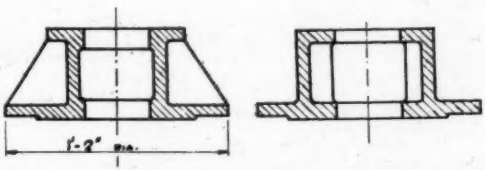


FIG. 9 (*a*) (*left*).—*Bad example of casting design; a core is necessitated between the flanges to make it suitable for machine moulding.* FIG. 9 (*b*).—*Improved design for economical production.*

but in the Author's own experience they most likely double the moulding costs owing to the need of coring between them.

Too often is seen the design as shown in Fig. 9 (*a*) of a casting which would require coring round the outside, if it were made by machine moulding. In machine moulding, the approach to the work is different from that of hand moulding, and as it is not permissible or practicable to make the flange loose, the only alternative in the design shown in Fig. 9 (*a*) is to incorporate an outside core which would add considerably to the cost of the job. This core in turn would necessitate the patterns being moulded in a relatively larger box, thereby further increasing the cost. A much better design is shown in Fig. 9 (*b*) which still retains the main points of the casting; depth, diameter of flange, etc., but reduces the cost, owing to simplification, by the elimination of the bottom flange.

In order to compare the differences between the two designs (Figs. 9 (*a*) and (*b*)) and to add weight to the argument, the following figures are quoted. It will be assumed that the outside diameter is 14 in., this being the controlling factor, and the mould is made by green-sand methods. The re-designed casting would be moulded at the rate of 22 to 24 moulds per hour in a 21 by 18 in. moulding box, but the first design, requiring an outer core, would have to be moulded in the next size box, namely 2 ft. 4 in. square, at the rate of seven to eight per hour. Thus, the design with two flanges would be three times as expensive to mould as the re-designed casting, excluding the cost of the core, and the extra moulding sand. It is by such forethought and alteration that a casting can perform its primary function at less cost than when produced by the original method.

(*To be continued*)

A Good Year for Scottish Industry

In contrast to the figures quoted elsewhere* for iron-founding, Scottish industry, generally, had a prosperous year in 1954. This is revealed in the Scottish Home Department's White Paper on "Industry and Employment in Scotland, 1954" (Stationery Office, price 2s. 6d.), and the "Digest on Scottish Statistics, April, 1955" (Stationery Office, 4s.). According to the White Paper, though the level of unemployment in Scotland remained higher than in Britain generally, it was substantially lower in 1954 as a whole than in 1953. During the last quarter of last year the number of unemployed was less than in the corresponding quarter of any year since 1947.

A number of substantial schemes by North American companies contributed towards new factory building, more of which was approved than in any year since 1946. The Scottish Industries Exhibition was an outstanding success, and a greater volume of business is believed to have been transacted than at the previous exhibition in 1949.

Speaking of industrial research, the report states that the publication of research work is not sufficient to ensure the adoption of new techniques and ideas by industry. During 1954 steady progress was made in building up the Mechanical Engineering Research Laboratory at East Kilbride.

The report states that by 1954 the shortage of steel plate experienced in 1952 and early in 1953 was overcome, Scottish plate mills contributing to the general improvement. During 1954 a modern mechanized plant for the production of steel sheet was brought into production by Frederick Braby & Company, Limited, in Glasgow. The Iron and Steel Board approved a £20,000,000 scheme by Colvilles, Limited, for the construction of two batteries of coke ovens.

There was a 5 per cent. increase in industrial output in both 1954 and 1953, but in 1954 the progress stemmed from Scotland's export industries, whereas in the previous year trades producing for the home market played the more prominent part.

* See page 437 of this issue.

End of a Long Association

The chairman of W. & T. Avery, Limited, weighing machine manufacturers, of Birmingham, Sir Walford H. Turner, is to retire after the annual general meeting in July. Sir Walford has been chairman of the company since 1940 and a director since 1919. He is also chairman of Wrights' Ropes, Limited, of which he has served on the board since 1908, the Rollason Wire Company, Limited, and Parnall & Sons, Limited. A director of the Wellington Tube Works, Limited, in 1941 he was appointed Regional Controller for the Ministry of Supply for the West Midlands.

Sir Percy H. Mills, vice-chairman, has relinquished the managing directorship, and will succeed Sir Walford as chairman. Sir Percy is a director of many companies, including Babcock & Wilcox, Limited, Parnall & Sons, Limited, and Textile Machinery Makers, Limited. He was Controller-General of Machine Tools, 1940-44, head of the Production Division, Ministry of Production, 1943-44, and president of the Economic Sub-committee of the British Element of the Control Commission for Germany, 1944-46. He has also served as president of Birmingham Chamber of Commerce, chairman of the National Research Development Corporation, and president of the Engineering and Allied Employers' National Federation. Mr. W. Leonard Barrows becomes vice-chairman of W. & T. Avery, and Mr. Austin Morley managing director. Mr. D. R. Palmer Lewis has been appointed to the board.

An Economist on Needs of Management

Management should become more of a professional skill, a skill studied in the firm and outside it, according to Mr. Graham Hutton, the economist. He told a meeting arranged by the Glasgow Productivity Council that it must explain more, discuss more, understand more, and co-operate more with staff and work-people.

In the trade-union world, as in management, went on Mr. Hutton, the chief problem was to raise the average level of members' understanding of the modern economic set-up and its problems. "Unions to-day," he said, "do not stand to gain half as much from the old-fashioned ways of negotiating and bargaining—ways that so often ended in strikes, the last and worst weapon in a poor armoury—as they can now gain from the far better armoury of detailed argument on accountancy figures, work-study, calculations, work-load figures, and other expert weapons."

On productivity, Mr. Hutton said that even 5 per cent. more production would have prevented recurring post-war crises. It would have reversed the upward trend in British costs and prices and would have meant that wages and other incomes, though staying stable, would buy more for the first time since the war began 16 years ago. Rising productivity, from the same resources would quickly raise real incomes and make British exports competitive by bringing costs and prices down.

Ingot Output Record

Ingot output from the Abbey, Margam, and Port Talbot melting shops for the week ended March 19 totalled 37,222 tons—139 tons more than the previous record set up in February. This was one of several records set up within the Richard Thomas & Baldwins, Limited, and Steel Company of Wales, Limited, group for that week.

The Abbey three-stand mill produced 11,292 tons, 145 tons more than the previous record, and the Trostre five-stand mill 10,049 tons—544 tons more than the works' record.

Latest Foundry Statistics

As reported by the Ministry of Supply, the output of aluminium alloy castings during 1954 was 80,836 tons, made up of 21,064 tons of sand castings; 44,269 of gravity-die and 15,143 tons of pressure-die-castings. The January production was 1,932, 4,044 and 1,494 tons in each of these categories respectively.

From figures given in the British Iron and Steel Federation Bulletin, employment in steel foundries on February 5 was 19,629, showing a decrease of 72 since January 8 and over 200 as compared with a year ago. The weekly average delivery of steel castings during January was 4,100 tons, as against 4,500 tons in December, 1954, but the same as January, 1954.

National Brassfoundry Association

MR. E. N. HILEY, the secretary of the National Brassfoundry Association in a private letter to the Editor points out that in the leading article of April 7, the writer neglected to take into consideration the important rôle played by the National Brassfoundry Association in the work of increasing the productivity of the non-ferrous foundry industry. The Editor is bound to agree with him and apologizes for his oversight.

Melt-quality Tests—1 Non-ferrous

IBF Symposium Discussion in London

Topics raised in this discussion among London branch members of the Institute of British Foundrymen showed the wide interest aroused by the facts and problems enunciated by the original speakers—Dr. V. Kondic, Mr. J. Wood* and Mr. A. R. French† representing academic, light-alloy and copper-base aspects respectively. Practical viewpoints were expressed as to the acceptance of tests by engineers and the relation of test-bars to castings. More theoretical approaches were put forward as to the influence of different types of freezing phenomena on test results; on the estimation of alpha phase in copper-base alloys, and desirable trends in testing procedures. It was generally agreed that an essential prerequisite was the establishment of means to produce sound test-bars.*

Allowance for Density and Permeability

MR. BURSER asked Dr. Kondic whether, in producing his test-pieces, any allowance was made for the rammed density or the permeability of the sand and other moulding factors.

DR. KONDIC replied in the affirmative and said he was hoping, in introducing the test, to eliminate moulding variables, and to use moulds which could be made in the ordinary way with green sand by ordinary moulders. But green sand has so many snags that he at present makes all the moulds either in CO_2 or in core sands. This is just a question of suitability under particular working conditions. If due care be taken, green sand could be used—but working in CO_2 sand is very much easier.

MR. MORRIS invited Mr. French to elaborate on the machining of his high-tensile-brass (manganese bronze) test-bars.

MR. FRENCH said that he was not very knowledgeable on the subject of machining. He had been concerned about the inconsistency of the test-bar results given by bars cast from individual heats. One of the factors disclosed during the investigation was the introduction of work hardening of the surfaces of some of the test-bars. This work hardening was due to the use of blunt tools in machining, and it had been found necessary to limit the number of bars which a machinist was allowed to turn before changing his tools.

Acceptance of Tests

MR. A. TALBOT suggested that if one could get people to accept a melt-quality test as standard one might do better than by providing test-bars. He asked what prospect there was of the acceptance of a melt-quality test result rather than test-bars, because he did not think test-bars bore a strict relation to the quality of the castings.

MR. FRENCH said that it was well known that the test-bar was not intended to indicate the soundness of a casting. The purpose of the test-bar was to ensure consistency in melt quality, to check that one heat of metal was of the same quality as other heats in the same alloy had been. For this purpose it was necessary to make a standard casting which, made under standardized conditions, should give a standardized result—this is the casting which was called a test-bar.

With regard to the alloys based on copper/tin, he felt that people did not know nearly sufficient about controlling the variable conditions to enable them to make standard test-bars, and this deficiency in knowledge must equally apply to castings in general. Far too little was known, for example, about the effect of variables in running systems and mould quality, and the effect of impurities in the metal, which could affect both gas content and solidification characteristics. The problem called for a fundamental study. Foundries had been making castings in these alloys for 3,000 years, but only during the last 20 years had any fundamental metallurgical investigations been made, and those had been concerned with the influence of dissolved gases.

Test-bars *vis-à-vis* Castings

MR. E. C. MANTLE said that it was true that when making a small gunmetal casting one could often get a columnar skin over the whole of the casting and the casting would then be pressure tight. When making a larger casting, however, unless one resorted to special measures such as extensive chilling, there was great difficulty in ensuring the presence of this columnar skin and generally the casting would consist of equi-axial grains. In those conditions it was the effect of the gas content of the metal on the distribution of the shrinkage unsoundness which played a major part in the pressure-tightness and soundness of the casting. The test-bars which Mr. French showed having a columnar structure and high-tensile properties did not in any way reflect the gas content of the metal and were, therefore, useless as a measure of melt quality, though, no doubt, they served a useful purpose in satisfying the inspection authorities.

MR. FRENCH, replying, said he felt that with regard to the alloys based on copper/tin, for example the gunmetals, there had been a confusion of ideas concerning the effects of factors influencing gas content and mode of solidification. Because most of the work which had been done had been concerned with gas content, it was possible that many foundrymen in trouble thought only of gas content. If one wished, the gas content of every

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* Papers printed in the JOURNAL, April 7.
† Mr. French's contribution appeared in the JOURNAL, March 10 and 17.

heat could be brought under control by the use of oxidation/reduction techniques, nitrogen for degassing, or phosphorus additions for mould/metal reaction, so that variables in melt quality could be independent of gas content. If one wanted to know whether the gas content was under control, methods were being developed—Mr. Hudson was developing one such method—for the determination of the gas content.

The reason why difficulty had been experienced in obtaining consistent results in test-bars was because of the operation of two sets of variables, those influencing gas content and those influencing mode of solidification: by the control of mode of solidification the gas content variable would be largely eliminated and results of some value would be obtained.

Whilst there were many castings of heavier sections than those of test-bars, equally, there were large numbers of important castings being made in gunmetals with similar and smaller sections, and if with such a relatively simple casting as a test-bar it was difficult to maintain the consistency of the product, how much more difficult must it be to control the consistency of relatively complex castings. It might well be that a better understanding of fundamentals would result in better casting techniques, and possibly better alloys as well, with which the mode of solidification would be under control and there would be less sensitivity to gas content. Admittedly, with heavy sections, gas content would remain a factor to be considered, but this could be controlled by nitrogen degassing, and with improved knowledge on the control of mode of solidification it might well prove a less significant factor than it is at present.

Freezing Range

MR. A. L. PENDREY referred to direct-reading spectroscopy as this enables confirmation that the molten charge complies with the relevant specification. A test he had seen used, was to immerse a pre-heated pear-shaped mould in the molten metal and allow the piece to cool slowly. The test-piece weighed about 2 lb., was cut in half and machined. By means of it, gas contamination is apparent and the inherent grain-size could be observed. He considered that the freezing range was one of the most vital factors in order to make sound die-castings and would like to see a means by which a sample of the molten metal could be put in an apparatus and the freezing range determined quickly, *e.g.* by using a fast inverse-rate recorder.

MR. WOOD agreed that, on grounds of cost, the use of direct-reading spectrography was ruled out, particularly for small foundries. Freezing range was important, of course, in controlling the quality of a casting; but he felt that the more important factor was the amount of eutectic present, and not so much the freezing range itself.

DR. KONDIC pointed to his spider samples as being useful in connection with freezing range.

MR. A. W. BRACE commented that Mr. Wood was very well balanced in his general judgment of the limitations and advantages of vacuum methods for assessing any particular gas content. One felt that in considering the control of melt quality it was necessary to be clear about its purpose and he suggested that the requirements of foundries varied considerably in that respect.

In the work he had been associated with, where control of gas content has been based on visual (microscopical) control, it had been found important also to ensure that the metal in the foundry was under control, and to maintain a consistent circulation of scrap and scrap/ingot ratio. The control test required by most foundries was one which would assess the general quality of the metal, gas content and grain size. The fracturing of a small, stepped casting gave a very useful indication of grain size, and examination under the microscope gave information on the gas content. By making a casting of sufficient section, very small amounts of gas could be picked up. A general limitation was that the operation of the control system was dependent on a certain amount of experience. Furthermore, where one had a difficult job, needing a particular gas content, it was necessary to approach it in another way.

Mr. Brace suggested that the reason why not many people were taking up the vacuum method very enthusiastically was that it involved buying a piece of equipment which might cost anything up to £100 and its value to them might be somewhat limited, inasmuch as it could be helpful only for a particular alloy or a particular type of work. On the other hand, he did appreciate that where one was handling large quantities of metal and wanted a rapid assessment of melt quality, the vacuum method had a lot to commend it.

The fluidity test-piece described by Dr. Kondic was interesting and it seemed possible that it might be combined with a small test-block of larger dimensions, so that the fluidity, grain size and gas contents could be obtained from the one test-specimen, using purely visual assessments.

MR. WOOD said it was quite obvious that what one could afford to pay for apparatus depended on the use that could be made of it. A great advantage of the vacuum method was that it showed clearly whether or not the metal was gassed, with other methods, there was difficulty in distinguishing between porosity due to gas and to shrinkage.

Application to Other Metals

DR. KONDIC, speaking of grey iron, said that the star test was extremely useful in indicating carbon and silicon contents; it gave a good indication of the chilling power of iron at a glance. Thus, in this rather unique case, the star test was capable of indicating both temperature and the composition. With other alloys, the test could be used as a measure of either the temperature or metal composition (*i.e.*, quality) but not of both, and one has to be measured independently by other means.

Estimation of Alpha Phase

MR. MOORE asked if Mr. French could elaborate on the specific advantages of the estimation of the

alpha content of manganese-bronzes and brasses, as against estimation of the zinc loss by the chemical determination of the copper content.

MR. FRENCH said that the alpha content was really what one wanted to know. If the basic composition were under control and the essential elements within close limits, then, by maintaining the alpha : beta ratio in the required proportions the desired results would be obtained. Supposing, for example, that the aluminium content of a high-tensile brass was ½ per cent. low. As a result of the copper determination ½ per cent. zinc would be added to compensate for this ½ per cent. deficiency in aluminium, but, as the zinc equivalent of aluminium was 6, the resulting error would be a deficiency of 2½ per cent. zinc, equivalent, approximately, to 25 per cent. alpha, with serious consequences with regard to the mechanical properties which would be obtained. By the use of the fracture-bar or the sand-bar micro-examination method suitable compensation for the low aluminium content would be made.

Desirable Progress

DR. SCHEUER confessed that he was somewhat bewildered by the discussion. He had come to the meeting with the idea of having recommended to him a test or a couple of tests which would help the foundrymen, and he believed that that was what normal foundrymen had come to hear. However, they were now wiser men, because there seemed to be no such test. It had been explained that they needed about twenty tests to do what they were setting out to do.

Perhaps that sounded rather too pessimistic. He felt that, in order to arrive at something useful, one must come down to a definition of a foundry melt-quality test. If, for example, one included tests specific for one type of alloy composition, an enormous complication was encountered. He felt that if anything of a general nature were likely to come out of the endeavour it would be probably a test for qualities which were not connected with the main components, but only with things which one was accustomed to refer to vaguely as impurities. For example, gas was an impurity of that sort, and there were minor components which exercised an unduly important influence on the foundry properties. Then one should perhaps be able to concentrate on things like gas content, grain size and non-metallic inclusions.

However, his remarks were not in any way intending to detract from the value of the various more specific tests which had been outlined. A test on gas content, grain size and non-metallic inclusions would probably constitute something that would be useful for 80 or 90 per cent. of foundries.

What is a Real Criterion ?

THE CHAIRMAN (Mr. F. Hudson) said he was inclined to agree with Mr. Mantle. From what had been said at the meeting, there appeared to be some considerable confusion as to what really constituted a true melt-quality test. His definition of a melt-quality test was a test which would indicate to the furnaceman whether or not his metal was suitable for pouring into moulds. The furnaceman was not interested in grain size, or in test-bar figures, which in many cases were affected by other factors outside his control. For example, it was well known that pouring and feeding methods had an important effect on the properties of test bars. If the furnaceman could assure his foreman that the metal was all right, the foreman could then look for other causes, such as mould design, feeding and running of the casting, etc., to see what was wrong there. There was a real need for a simple test which could be used by even the smallest founder and which could be applied by any furnaceman. A test which would indicate in a simple way that the molten metal was of the correct quality for going into the mould.

A small group consisting of himself, Mr. Ruddle of the British Non-Ferrous Metals Research Association, and Mr. Brown of the Morgan Crucible Company, had given some thought to this matter and had evolved a test which might meet requirements and it was hoped to publish a paper on this subject at an early date.

DR. KONDIC said that after listening to Dr. Scheuer and the chairman he could not help but feel that they were on the wrong track. They were both non-ferrous metal founders. If they were trying to develop a test which would be suitable for all the alloys, they were really proceeding towards something which was not likely to be required by all the foundries, because most foundries were different and their requirements were different. The test they had referred to might be very good for the particular metals they had in mind, but he was sure it would not be suitable in, for example, a malleable iron foundry.

Vote of Thanks

MR. DOUGLAS MORRIS, proposing the thanks of the meeting to the three speakers, said that all had been very interested to listen to them. Mr. Talbot was on the right lines when he had said that in the past foundrymen had been devising moulding methods to make test-bars rather than developing melt-quality tests to help founders to make better castings. Mr. Hudson had shed light on the troubles that were being experienced, and had given hope of better methods in the future.

One felt that many variables in test-bars, especially of gunmetal, could be traced to the methods of charging the crucibles or furnaces. Also many non-ferrous metal troubles in small moulds could be caused by atmospheric conditions, especially with L.33 and gunmetal alloys. In the foundry with which he had been concerned in the past he had been very shocked by the variable results obtained from gunmetal test-bars; he had fixed runners to test-bar patterns, just as Mr. French had shown in his film, and had obtained far better results thereby.

All present at the meeting, he concluded, had benefited by the discussion, and Mr. Morris proposed with the greatest of pleasure a hearty vote of thanks to the speakers.

DR. RHODES, seconding, said he had enjoyed the discussion very much indeed, due very largely to the excellent contributions by the three opening speakers.

(The vote of thanks was carried with acclamation.)

Ladle Metal-depth Indicator

To reduce the make of steelworks scrap it is necessary to know towards the end of a cast, if there is sufficient metal left in the ladle to fill one or more ingot moulds. Efforts, eventually proving successful, to devise a suitable indicator are described by A. M. Hamilton, of Colvilles, Limited, in a Paper on "The Colville-Hamilton Ladle Metal Depth Indicator" presented at a meeting of the West of Scotland Iron and Steel Institute recently. After investigating a number of ingenious methods which for various reasons proved impracticable, the idea occurred to the Author that a simple contact member to indicate possibly the difference of electrical resistance between molten metal and slag or a simple break in an electrical circuit would be the answer to the problem, provided some means could be found to get that contact member inside the ladle and to withstand the metal temperature long enough to give an accurate depth reading. Various arrangements were tried and ultimately a pair of electrodes consisting of ¼-in. dia. steel pins was located in horizontal grooves formed at each side of a ladle brick, one 3 in. higher than the other and extending throughout the brick depth from the front surface to the rear face. The inner ends of the pins were connected to a milli-voltmeter in order to indicate when a contact was uncovered by the falling level of the metal. A number of trials were then put in hand to discover the most suitable height at which to set the contact member. It was found that if the position was too high, the error due to the wear on the ladle lining from heat to heat was also too great. If set too low, too little time was allowed to proportion out the remaining metal. There was also the danger of partially solidified metal covering the tips of the contact member and so causing a short circuit. The most suitable position was found to be one-fifth the height from the bottom of the ladle. At this position, ample time was available to proportion out the metal to best advantage; there was very little chance of a ladle skull reaching to this height; and the wear on the ladle lining could be fairly accurately calculated from heat to heat. Over a long period this ladle wear was adjusted and readjusted until a reliable figure was reached.

When unusable ingot-ends were made with this indicator in use it was due more to the inexperience of the operatives than to any shortcomings in the instrument. The main cause of error was in guessing wrongly the amount of metal already poured into a mould when the instrument registered. This set the problem of ascertaining accurately the amount of metal in a mould at any given time. Various ideas were tried, but finally an instrument like a sextant which could be sighted against the inside top surface of the mould to the point where the molten metal level reached the opposite mould wall was adopted. The angle of the instrument to the vertical, shown on a graded scale, gave a fairly accurate estimate of the mould contents. This instrument can also be used when filling a standard mould to any given height or weight. The depth indicator will accurately register the level of the molten metal in a ladle at any predetermined point and, with intelligent use, it will cut down unusable scrap ends to a minimum.

AN OUTBREAK OF FIRE occurred at Lloyds Foundry in the Wellington Street extension, Burton, but damage was confined to a conveyor belt, and electrical installation in the sand plant apparatus. A workman received slight burns to the face and hands, when he attempted to put out the fire.

British Standards Institution

Code of Practice for Zinc-alloy Pressure-die-castings for Engineering

The British Standards Institution announces the publication of the above Code of Practice (CP. 3001: 1955), which has been prepared jointly with the Institution of Mechanical Engineers. This Code has as its objective the establishment of recognized practices in the design, production and inspection of zinc-alloy die-castings, in order to ensure that the materials used, the procedures followed, and the design of the castings, shall provide a product that is reliable in every respect. Pressure die-casting in zinc-alloy permits the very rapid production of engineering and allied components and also intricacy of design. It has therefore obvious advantages when a component is required in large quantities. For engineering components, however, mechanical properties and durability are important considerations, and for this reason the best features of design should be employed and optimum casting technique adopted.

Zinc-alloy die-castings will perform satisfactorily in service only if they are free from contamination by certain elements harmful to the mechanical properties and corrosion resistance. The Code, therefore, states that it is essential that these elements should not be present in higher proportions than those indicated in BS 1004 "Zinc Alloys for Die-casting." Copies of this Code of Practice may be obtained from the Sales Branch, British Standards Institution, 2, Park Street, London, W.1. Price 5s.

Johnson Society's New President

Members of the Johnson Society have elected Sir Charles Swift Lillicrap as their president for the ensuing year. His election was announced following the Society's annual meeting at Lichfield, and it is interesting to learn that the new president has visited the city only once and he did not then have time to explore the Johnsonian side of the city. Sir Charles has, however, a great love of English literature and is especially interested in the works of Dr. Johnson.

Sir Charles Lillicrap, who was Director of Naval Construction at the Admiralty from 1944 to 1951, is vice-president and chairman of the council of the Institution of Naval Architects and chairman of the council of the British Welding Research Association. His commercial activities include a seat on the board of J. Samuel White & Company, Limited, shipbuilders, boilermakers, etc., of Cowes (IoW).

Three Services—One Appliance

The first appliance to provide the three services of cooking, house heating, and water heating was on view to the Press recently at Much Park Street, Coventry, where field tests have just been concluded at new open-plan maisonette flats above shops in the city's redeveloped smokeless area.

The appliance, named the "Heatmaster," and manufactured by the Radiation Group, Limited, Armley, Leeds, 12, is also believed to be the first appliance, capable of burning coal or coke, to provide thermostatic control over a full range of oven temperatures. It evolves from the company's pioneering in the fields of whole-house warming by ducted warm air, insulated freestanding cookers and water heaters, and in the downdraught principle of combustion to eliminate smoke from coal.

New Mechanized Foundry in Scotland

Specialized Production of Conveyor Accessories

At the new foundry of Mavor & Coulson, Limited, in Glasgow, mechanization is now well advanced. The area covered is almost two acres in extent, and, as indicated on the plan, Fig. 1, it comprises three bays in which are the mechanized plant, floor moulding and fettling, core-making, pattern-shop, machine shop, and mechanics' workshops. Other buildings house the non-ferrous foundry, pattern store, laboratory and shot-blast plant.

In the mechanized bay, the sand-conditioning plant A comprises a bucket elevator, a belt conveyor, two rotary screens, two storage hoppers, a skip-hoist and two 3,000-lb. batch mixers with aerators. Belt conveyors B distribute the sand. The first belt feeds ten hoppers supplying sand to moulding machines C; the short conveyor at right angles delivers to the third belt, which supplies hoppers for the floor-moulding bay and sand-slinger L. Any sand left on this conveyor passes down a chute to another conveyor, which runs underground and returns the sand by way of the bucket elevator to storage hoppers; this belt also handles sand reclaimed from a static knock-out in the floor-moulding bay, and from the knock-out station F, which includes a shaker chute and a vibratory knock-out. A pallet mould conveyor having a circuit of 460 ft. takes moulds to the pouring platform E and knock-out station F.

Moulding Methods

The mechanized plant is used chiefly for casting conveyor idler-rollers and idler-brackets. The side and centre rollers are made in diameters of 4 in. and 5 in. and lengths from 6 in. to 17 in. The moulds for the rollers are made on five moulding machines with a sixth machine as standby. For the side rollers which are closed at one end the mould is a plain cylinder, the main core carrying ribs and a boss for the ball bearing. The method of moulding is unusual in that the main core is inserted in the pattern and rammed in the mould, and therefore has not to be jolted, but only squeezed, using special squeeze-boards. Before being placed in the pattern, the cores are checked in a jig to ensure that they will be concentric with the mould. For the centre rollers, the mould is also a plain cylinder, and the main core carries a boss at each end for the ball-bearing assembly. The pattern is placed loosely on the pattern plate and is jolted up to three-quarters of its length. An end core which registers the main core is then inserted, and the remainder of the mould is squeezed.

On completion of both types of roller moulds, a baseplate is clamped to the flask, which is turned over on to a short length of gravity conveyor. The pattern is then withdrawn by hand, and the mould transferred to a pallet conveyor. Tapered flasks are used to facilitate stripping the moulds. Each flask holds four or six castings depending on the diameter of the rollers. The tops for the roller moulds are

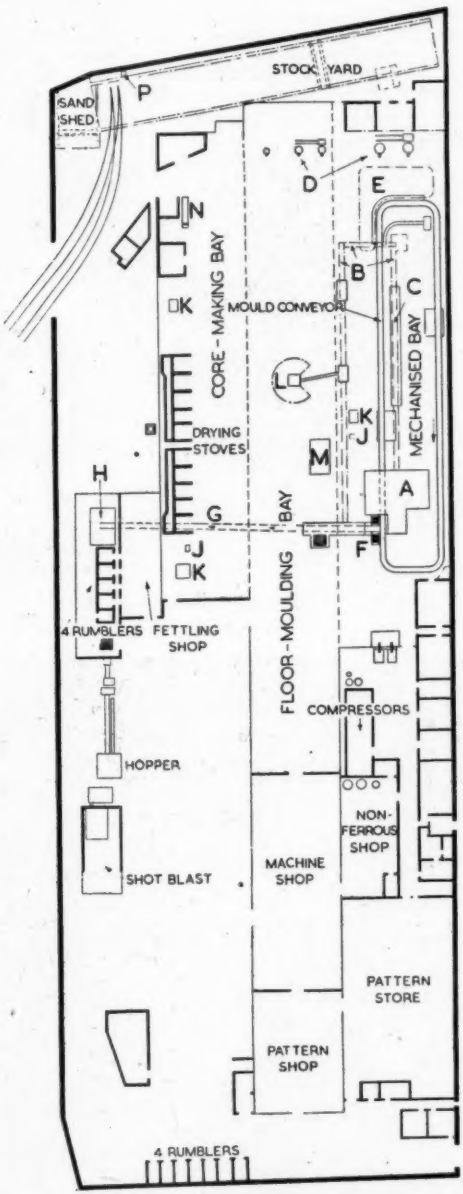

FIG. 1.—*Layout of the new Mavor & Coulson foundry in Glasgow.*

made on a swing-head squeeze machine. The bracket moulds are produced on three moulding machines.

After leaving the pouring station (Fig. 2), the flasks are stripped from the moulds behind the moulding machines, leaving the moulds with castings and baseplate on the pallet conveyor. Plans are in hand for covering over the pallet conveyor between the pouring and knock-out stations; openings for the removal of the tops and the mechanical stripping of the moulds will be provided, and fumes will be extracted from the tunnel and at the openings.

At the knock-out station F, the baseplates on which the mould and castings are sitting are tilted and castings and sand slide on to the shaker chute, the sand passing through grids to a hopper and the castings travelling along the chute, discharging on to an underground shaker conveyor G; this conveyor carries the castings 66 yds. to a pit H whence they are lifted in skips and taken direct to one of four rumblers housed in brick cubicles. The vibratory knock-out at F is used for castings which are too large for the shaker conveyor.

Reclaimed Sand

One of the problems encountered when production started in the mechanized plant was the high temperature of the reclaimed sand, owing to the high ratio of the surface area of metal to sand in the flasks. Cooling by evaporation was negligible as practically no moisture was retained in the sand, and the short distance from the knock-outs to the main storage hoppers ruled out orthodox methods of cooling. This difficulty was overcome by spraying the sand with water as it passes from under the knock-out grids to the hoppers below. Dust and fumes are extracted from the knock-out station, taken outside, and filtered through wet mattresses. A similar system removes dust and fumes from the sand conditioning plant.

FIG. 2.—*Pouring station (E) on the mould conveyor.*

Rumbling has been found to be the only satisfactory method of removing core sand from the idler roller castings. After rumbling, the castings drop into skips sitting in small trucks and are taken away for dressing. Later there will be eight rumblers, and the castings when rumbled will pass into an adjacent fettling shop for final dressing, inspection, and despatch. A belt conveyor running under the rumbler cubicles takes away waste core sand from the rumblers, and discharges into a 25-ton hopper from which the sand is loaded direct into lorries for disposal. Waste from the floor-moulding bay can be emptied through a grid at floor level on to the same conveyor for transport to the hopper.

Cupola Plant

Metal for the mechanized bay is obtained from two 8-ton cupolas D charged by skip-hoist and lined to give about 4 tons/hr. A syphon brick allows pouring to be controlled. In the wet spark-arresting equipment, 40 gal. of water per minute are sprayed at 60 lb./sq. in. on to the arrester cone, and the water and sludge are piped to a settling tank. Before this was done, the roofs and gutters near the cupolas required cleaning every week because so much ash was deposited from them. Two 3-ton cupolas, working on alternate days and charged by a skip-hoist, supply metal for the floor-moulding bay; a 30-cwt. cupola is available for experimental work. In this bay a variety of castings is produced weighing up to 30 cwts. The sand-slinger L is for moulds for conveyor driving, take-up and snub pulleys, and a pattern withdrawing machine will be installed. The station will be arranged for the rapid production of pulley moulds, but it will also be suitable for slinging moulds for the general run of foundry work. Moulds are skin-dried in a gas-fired tunnel M, 8 ft. 6 in. wide by 20 ft. long. Floor-moulded castings are dressed at the end of the bay.

The third bay is used mostly for core-making, a gas-fired rotary drier providing two tons of dry sand per hour. A great many idler roller and idler bracket cores are made here and dried in turret stove K, the rest being made in the mechanized bay. The cores for the pulleys and other jobs are dried in two batteries of coke-fired stoves, each battery having five compartments. Successful experiments have recently been carried out with blowing pulley cores on a core-blower, and this machine will be used for several sizes of pulley cores, which will be dried in a turret stove. The intention is to make all the roller and bracket cores in the mechanized bay, next to where they will be used. The sand drier will be moved close to the stockyard, for convenience in filling the hopper that supplies the drier. A suction and cooling system will take dried sand to the mechanized bay and to the core-makers.

New Equipment

Safety Goggles

A new range of safety spectacles, known as the Highway pattern, have recently been introduced by Fleming Safety Goggles (division of J. & R. Fleming, Limited), 146, Clerkenwell Road, London, E.C.1. These are of flesh-coloured plastic and, as will be seen from Fig. 1, are of modern design. Hockey end sides can be supplied instead of the cable sides shown, and three bridge-widths are available, so that it should be possible to see that everyone using them is comfortably fitted. A similar frame without sideshields can be supplied for use where frontal protection only is necessary. Normally, these spectacles are fitted with Armorglas toughened lenses, to give protection against heavy blows from metal or stone, but a range of coloured lenses is available for those who require protection against glare or infra-red and ultra-violet radiations.

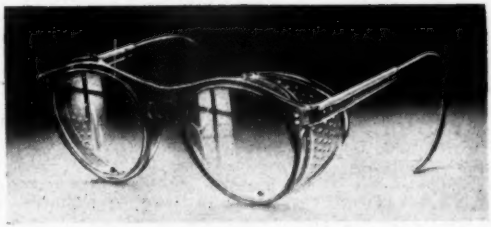

FIG. 1.—*Fleming plastic safety goggles.*

Vibratory Conveyors

The Owl Engineering Supplies Limited, 16, South Parade, Doncaster, have issued details of a vibratory type of conveyor, shown in Fig. 2 as a tubular construction, though the trough form is also available. Material can be loaded on to the conveyor at any point and as much as 100 tons per hour can be dealt with. It is claimed that with some materials an incline of 20 deg. can be incorporated. The conveyor shown in the illustration is powered by two totally-enclosed electric motors coupled by an intermediate gearbox. The complete driving unit is mounted on the tube by means of a fabricated saddle. All tractive forces and pressure strains are compensated in the articulated laths which couple the conveyor tube to the steel base, thereby confining the vibration to the conveying element and ensuring the efficient transit of the material.

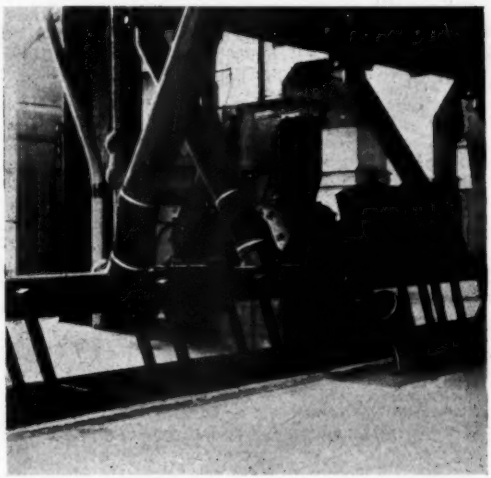

FIG. 2 (*above*).—*"Owl" vibratory conveyor installation with inlet pipes for feed to the unit arranged along the conveyor; the driving portion is mounted on the tube.*

New "Atlas" Grinder

Developed to take full advantage of the new reinforced grinding wheels which are now available, a new grinder, the LSS-81, is being marketed by the Atlas Diesel Company, Limited, Wembley (Middx). Light in weight with an extremely high power output, it is capable of using the maximum cutting ability of the latest reinforced wheels. This combination opens up a field of applications hitherto restricted to expensive machine tools. In some cases the uses for this equipment go beyond the scope of grinding altogether.

Foundries should find the combination useful for notching and cutting off risers in all metals, while the same tool and wheel can be used equally well for general finishing of castings. Other uses include dressing down heavy welds and bevelling plates, etc. The grinder has a particularly high power: weight ratio—2½ h.p. to 11 lb. Height less hub is 8¼ in.

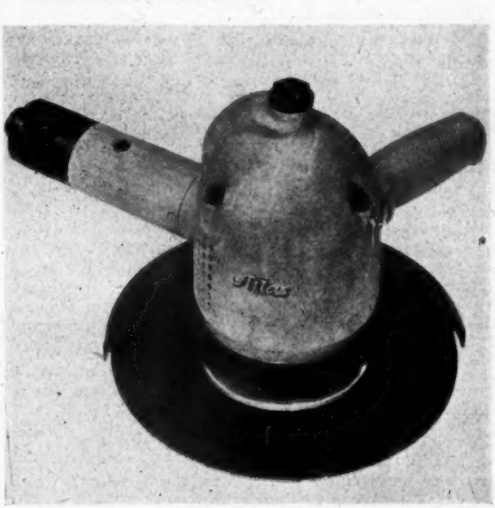

FIG. 3 (*right*).—*"Atlas Diesel" LSS-81 grinder using the latest type of reinforced wheels.*

THE FIRST TRADES SCHOOL in Scotland, specifically designed for the purpose, should be built in Paisley, at a cost of £250,000 within the next two years. Plans were submitted by Renfrew County Council and approved by Paisley Dean of Guild Court last week. They provide for three labs, three drawing rooms, eight classrooms and 13 workshops.

Business in Scrap Metal

At the Monmouthshire Assizes at Newport on February 14 charges against Cox & Danks, Limited, for selling scrap metal above the maximum price were dismissed on the direction of the judge. It was alleged that the buyers were overcharged because the full transport allowance supposed to have been made to the purchasers, who transported the metal themselves, was not deducted. The case is of considerable interest to the foundry scrap trade and an extract from Mr. Justice Devlin's findings is printed in what follows.

In the course of his address to the jury Mr. Justice Devlin said:—

"The whole question is a simple one of whether the buyers and the sellers have allowed a proper amount as abatement. You will remember the words about that in the regulations, and they are that where the transport is effected by the buyer's own services not less than what would be the buyer's reasonable commercial cost of effecting such transport in the normal course of his business, and that is how the abatement is to be calculated. It may be a rather hard thing to put upon a buyer and a seller the duty of making that calculation themselves.

"There is a lot to be said for the submission that if the Minister wants to fix prices (as, of course, he has to do; we all know he has to do) and enforce his regulations by criminal prosecution, he should at least put a fixed price in and calculate it himself, when anyone can tell whether they are going above or below it. If he is going to leave it to the parties themselves it does not make life easier for commercial men. And, apparently, that is the view that the Minister is now taking, because he has put in his last regulations a definite sum per mile, subject to its being proved not excessive.

"In 1952, the year with which we are concerned, the actual cost does not enter into it at all, except it may be evidence of the reasonable commercial cost of the buyer. The buyer may say: 'It is going to cost me 30s. a ton'; but the seller is entitled to say: 'So it may, but that is because your lorries are very expensive or you pay your drivers too high or you use too much petrol. It must be so, because a reasonable commercial figure would be lower than that.'

"What one has to get at is a reasonable commercial figure. It seemed to me there was some evidence if it was proved that the buyers had actually paid a man 29s. or 30s. a ton, which was some evidence of what the reasonable commercial price would be until one heard what the explanation was. We now know what the explanation is.

"There is nothing in this regulation which prevents the seller from saying to the buyer: 'I can only charge you a certain price. I can only make a certain abatement if you transport it yourself, but I am not willing to sell you this scrap iron except on the basis that you take delivery of it yourselves in a lorry that would otherwise return empty. On that basis I shall only have to pay the reasonable commercial cost of the transport, on the basis that your lorries would otherwise return empty.' In other words, what has been called 'back rate load.'

"There is nothing in the regulations to prevent a seller from doing that; there is nothing in the regulations to require him to sell scrap iron to his buyer on any particular terms; he is not obliged to. In this case the seller offered it to the buyer on terms, and those terms were accepted. The seller said in effect: 'Ten shillings seems to me a reasonable rate for the back load'; and the buyer accepted it.

"It then becomes the duty of the prosecution, if they want to convince you an offence has been committed, to satisfy you that 10s. is not a proper figure for a back load rate. There is no evidence which I could leave to you that 10s. is not a proper figure for a back load rate. It is the duty of the prosecution to prove cases in these courts, whether they are under regulations or any other way. It is not for them to invite juries to speculate about whether 10s. may or may not be a proper rate; they have got to prove their case.

"They have failed to do so."

Shortage of Factory Space in Midlands

Shortage of both factory space and labour in the Birmingham area was put forward as a reason by Mr. Barry Kay, Regional Controller for the Board of Trade, why Midland industrialists should consider setting up production plants in Northern Ireland. Mr. Kay pointed out that during March alone 76 applications for industrial development certificates had been received, the highest monthly figure since 1949. The projects thus envisaged would require 1,130 workers. These applications brought the total for the first quarter of the year to 177, with a labour demand for 5,000.

With an eye to easing the position for Midland manufacturers, Mr. Kay recently paid a week's visit to Northern Ireland to discover the possibilities there. What he found in the shape of empty factories and abundant labour would, he said, be "a mouth-watering spectacle for space-and-labour-hungry Midland manufacturers."

Mr. Kay said that whereas in the Midland region there were 52,000 outstanding vacancies and an unemployed percentage of 0.5, Northern Ireland had 36,603 people unemployed, giving a percentage of 7.8. In addition to factories and labour, there were good shipping facilities from Belfast to all parts of the world.

"Industrial Output Must Rise"

Britain was facing developments far exceeding the first industrial revolution in significance, Sir Harry Pilkington, president of the Federation of British Industries, told FBI members in the North-West Region at their annual meeting in Manchester. Costs lately had been rising too sharply, he said. With such a situation it was essential for all in industry to realize that output must go up and that output per man-hour was the measure of ability to compete.

These danger signals of the past few months were a challenge to industry to help the nation along the course of a competitive economy, balancing our trade and payments and keeping the internal value of the £. Sir Harry did not believe that our balance of payments could for long be improved by restrictive policies and by developing uneconomic activities behind artificial barriers.

Fewer Unemployed

At the end of February, the number of persons in civil employment (industry, commerce, and services of all kinds) was 22,740,000, an increase of nearly 20,000 since the end of January. The total number of persons unemployed on March 14 was 270,000, including 19,000 who were temporarily stopped, a decrease of 12,000 since February 14.

Unemployment in March was 1.3 per cent. of the estimated total number of employees, the same as in February, and compared with 1.6 per cent. in March, 1954.

Mechanical Engineering Research

Recent Work at the National Physical Laboratory

Much work of metallurgical and engineering interest is in progress at the National Physical Laboratory, and not all is brought immediately to the notice of all the actual producers and users in the country. Current work such as that described below has definite and immediate applications, some of it directly to founders, and the final results of the research are awaited with interest.

Fatigue.—The fatigue strength of certain materials subjected to relatively high stresses for fatigue loading cycles between 10 and 10,000 is being investigated. It has been shown that fatigue strain rather than fatigue stress is the critical factor; the work is important in such cases as a bridge over which heavy loads pass at infrequent intervals.

The initiation and propagation of fatigue cracks is being studied. It has been found that in mild steel, cracks start and spread under either maximum shear or maximum tensile stress. In one aluminium alloy so far studied the cracks begin only under maximum principal stresses; this result is contrary to what would have been expected from a cursory examination of failures in heads of fatigue specimens where it appears that shear stress is the important factor.

High-temperature Materials.—Work on creep under simple tension is continuing at the National Physical Laboratory, but work on more complex stress systems is now in progress at East Kilbride. An investigation has been made of the properties of alternative materials for use as gas-turbine discs. They have been subject to cycles of loading and temperature corresponding to those occurring at the rim of the disc under working conditions. New equipment is now available for studying the behaviour of alloys and steels suitable for high-temperature operation under the complex stresses met with in practice. Further light has been thrown on the basic relations between creep, recovery, and relaxation, and on their dependence on time and temperature, for a magnesium alloy, an aluminium alloy and a carbon steel.

Lubrication and Wear.—Fretting corrosion is a particular kind of wear which occurs between closely fitting surfaces which undergo slight relative movement due to vibration. Earlier work had shown that the amount of damage depended on the total number of oscillations, on the load and on the atmospheric humidity. Electrical contact resistance measurements made during the fretting of hard steel specimens showed that after a short time the surfaces became separated by ferric oxide, a material of high electrical resistivity. Thus, in its later stages, fretting corrosion may be described as abrasive wear in which the abrasive material is produced by the wear process. Under the electron-microscope, the initial damage appears to consist of furrows produced in the surface by hard particles.

Plasticity.—The manufacture of almost all metal articles depends on plastic deformation of the material. The production processes involved fall into two main groups: formation processes such as hot and cold rolling, forging, pressing and deep drawing, wire drawing, and extrusion; and cutting processes such as turning, milling, shaping, drilling and grinding. Commercial practice in these fields has developed by trial and error with little appreciation of the basic principles involved. The Division is obtaining a fuller understanding of the fundamental mechanism of plastic flow, that is of flow beyond the elastic limit. The work should make possible a more efficient use of materials, a more exact and economical design of machinery, and a saving in power.

Materials under High Hydrostatic Pressure.—In formation processes such as extrusion and rolling, deformation occurs under high hydrostatic pressures. The properties and behaviour of materials under such high pressures are being studied to gain a better understanding of the proceses and to provide information on the range of validity of the assumption, made in the theory of plasticity, that hydrostatic pressure has no effect on the yielding of materials. Pressures up to 70 tons per square inch (10,000 atms.) have been achieved and measured by a small electrical resistance gauge specially developed for the purpose. Preliminary tests show that the ductility of materials is much increased under high pressures; materials such as bismuth and "Perspex," which are brittle at atmospheric pressure, show large deformations in tension at high pressures.

Metal-Cutting.—Most theories of the cutting process assume that the chip is formed in such a way that the amount of work done is a minimum. A theoretical investigation supported by experimental results has shown that this minimum work principle might not be valid. As a basis for a more exact theory the deformation of grids inscribed on the specimens and cut with tools of varying rake angles, as been examined. Results show that the rake angle had an appreciable effect on the coefficient of friction and that the effect of chip friction on the deformation mode differed considerably from that predicted by current theories. To establish the mechanism of tool wear, an attempt has been made to correlate the effect of rake angle on chip friction with changes in temperature on the tool face. A theoretical technique developed in the Division for estimating temperature distribution is being used.

High-Temperature Properties of Steels.—Work for the British Electrical and Allied Industries Research Association on the high-temperature properties of steels for new electricity generating stations has progressed considerably during the year, and

Mechanical Engineering Research

the tests have reached a stage at which some estimates of the performance of the steels are possible. It has become clear that it is practicable for steam temperatures to be appreciably higher than are contemplated at present; important improvements of the thermal efficiency of generating stations thus appear to be possible, but much development work is necessary before these improvements can be realized. As part of this work, an investigation of the properties of welds in these steels has been planned. Very interesting results have been obtained in the improvement of the high temperature strength of steels contaning 6 to 8 per cent. of chromium. It seems likely that that these steels will prove capable of bearing useful loads at temperatures well above 600 deg. C. and be able to replace the more expensive austenitic steels in certain components of generating equipment.

Electron Microscopy and X-Ray Spectrography.—A technique for preparing replicas of high resolution and contrast for the electron microscope has been successfully applied to the examination of the fine structures of heat-treated alloy steels. The first examination of a series of metallic alloys with the soft X-ray spectrograph was commenced during last year. This equipment enables the condition of the electrons within the metallic atoms to be examined directly, and it has proved possible to demonstrate changes in the electronic structure of magnesium produced by alloying it with aluminium, and also to make observations on the electronic structure of the aluminium atoms dissolved in magnesium. The observations have been made on specimens cut from massive samples of the alloy such as might be used in engineering practice, so that if the power and scope of the experimental method can be sufficiently developed, a new and more penetrating method of examining metallic materials will have been made available.

These and other researches of metallurgical interest are referred to in the section on mechanical engineering research contained in the annual report of the Department of Scientific and Industrial Research for 1953-54. (HMSO, price 9s.)

Open General Licence for Zinc

The Board of Trade announces the issue of an open general export licence authorizing the export to any destination other than China, Macao, North Viet Nam, or Tibet of specified brands of zinc ingots and slabs (or plates).

The open general licences for copper goods and for iron and steel goods have been revised to exclude North Viet Nam from the permitted destinations. China, Macao, and Tibet are already excluded. This change is consequent upon the recently announced extension of export licensing control to cover all exports to North Viet Nam.

These licences are dated April 7, 1955, and came into operation on Monday.

FIFTY-ONE EMPLOYEES at the Coombs Wood works, Halesowen, of Stewarts and Lloyds, Limited, have been presented with gold watches on completion of 30 years' service.

Brightening Industrial Darkness

Modern architecture often spares no pains in its efforts to afford a maximum amount of daylight. Indeed, as far as factory building is concerned, this tendency seems to have run riot, and many of the newer works bear a disconcerting resemblance to greenhouses. Commenting on this controversial trend at a meeting of Slough branch of the Institute of Industrial Administration during an address on the "Effect of Lighting on Productivity," Mr. W. Robinson, lighting officer of the British Electrical Development Association, said he could see no hope of general factory lighting ever serving industry as it should until a true balance was struck between natural and artificial lighting and until one ceased to treat artificial lighting as merely a necessary evil.

Referring to the disadvantages of the "all-glass" factory, where artificial lighting was generally inadequately installed "on the cheap," Mr. Robinson said that building, heating, and maintenance costs were all too high. The over-riding function of lighting was to provide a satisfactory visual environment and to contribute in full to a satisfactory working environment.

The right way was to illuminate the whole interior, including ceilings and walls, to a satisfactory and reasonably uniform level of brightness to ensure that there was the minimum glare, distraction, and unwanted shadows, continued Mr. Robinson. The inevitable result of this was an illumination level adequate for most visual tasks, and the addition of extra or special lighting for more difficult tasks was then a simple matter. The remarkable thing about industrial lighting was that industry had been content for so long to endure dark ceilings and walls, dark plant, and general gloom when it was quite unnecessary.

English Firm Buys Canadian Defence Plant

The Canadian Government has sold to the English Electric Company, Limited, the Scarborough factory, near Toronto, which comprises 14 acres of land, buildings with a floor area of 180,000 sq. ft., and related services. The title to Government-owned machinery and equipment located in the factory remains vested in the Crown, and the complete production facilities are to be maintained available for defence requirements for a 10-year period. These production facilities will be supplemented by modern machine tools and specialized equipment.

The factory, which was originally built in 1952 by the John Inglis Company, Limited, for the Canadian Department of Defence Production, and which has since then been run for the Crown, will continue to be operated by the John Inglis Company and the English Electric Company for the Royal Canadian Navy escort vessel programme.

When the naval programme is completed the new Scarborough factory, with the existing facilities at Toronto and St. Catherines, will substantially increase the capacity available to meet the needs of the expanding Canadian economy for the manufacture of heavy mechanical and electrical equipment.

Scottish Iron Castings Production

Figures issued recently by the Council of Ironfoundry Associations show that the UK output of iron castings in 1954 was 3,742,000 tons, a rise of 2.9 per cent. from the 1953 level and almost as high as the record outputs achieved by the industry in 1951 and 1952. Fourteen of the 22 ironfounding districts had higher outputs ranging up to 10 per cent. in the West Midlands counties among the major districts, and up to 25 per cent. in Essex and Kent among the districts of less intensive production.

The largest falls were shown by Scotland and Cheshire, Scotland's position has, in fact, deteriorated for the past three years, the figures for nine years being:—

52-week period	Thousand tons	Per cent. of UK Output by weight
1946	312.3	12.3
1947	341.3	12.2
1948	392.0	11.9
1949	398.9	11.8
1950	391.8	11.4
1951	416.2	11.1
1952	404.2	10.8
1953	388.6	10.7
1954	369.5	9.9

It will be seen that Scotland's actual output, in tons, reached a peak in 1951 and has fallen away every year since then. Scotland's output as a proportion of the total UK output, has declined steadily since the end of the war. It is pertinent to ask why Scotland's position should be relatively so poor.

The first fact to note is that the Scottish industry is divided into two sections—light castings and engineering and jobbing castings. Light castings comprise, so far as Scotland is concerned, rainwater, hot water and soil pipes, and gutters; stoves, grates, ranges, and other solid-fuel cooking apparatus; baths and other sanitary fittings; it is estimated that between 45 and 50 per cent. of the total UK output of light castings are manufactured in Scotland.

About 80 per cent. of these light castings are shipped to England or overseas, and production over the whole section has been well maintained, following the pattern of total UK production, which rose from 311,400 tons in 1953 to 328,000 tons in 1954. Production in the rainwater and pipe group rose by 20,700 tons, and in the sanitary group by 14,600 tons.

UK production of solid-fuel appliances fell on the year by 17,700 tons, however, and here again Scotland followed the total pattern. Demand for all-night burning fires was greatly stimulated in 1951 and 1952, and since then the market has contracted.

In the engineering and jobbing section, UK production rose by 3.8 per cent. from 1,432,000 tons in 1953 to 1,486,000 tons in 1954. Within this section, however, the tonnage of castings for marine engines fell from 75,600 in 1951 to 63,700 in 1954, and this position particularly affects Scotland, where, according to Admiralty figures published in the "Digest of Scottish Statistics," the gross tonnage of merchant shipping under construction fell from 858,600 at December 31, 1952, to 783,200 at December 3, 1954.

Such falls, however, do not fully account for the fact that Scottish production, which was 12.3 per cent. of the UK total in 1946, fell to 9.9 per cent. in 1954. Much of the reason for this is to be found in the expansion of the automobile industry in England, while there is no such industry in Scotland.

The section of the ironfounding industry catering for automobile and tractor construction produced a record tonnage in 1954 at 316,000, which was 16½ per cent. more than in 1953, when the figure was 271,000 tons. Agricultural implement and machinery castings, mostly for tractors, totalled 183,000 tons, or 27½ per cent. more than in 1953. There is every indication that this section of the ironfounding industry will achieve an even higher output in 1955.

The general drop in Scottish output, as shown in the table above, is reflected also in a lower labour force, although the UK labour force increased from 141,200 in 1953 to 142,751 in 1954. At June, 1954, according to the Ministry of Labour, there were 13,800 employees in the Scottish ironfoundries, against 19,500 in 1953 and 20,000 in 1952.

Grindstone made Unusable by Fencing

In an appeal before the House of Lords their lordships found that a grindstone in the steelworks of John Summers & Sons, Limited, Hawarden Bridge Steel Works, near Chester, must be fenced securely under the requirements of a sub-section of the Factories Act, 1937. The fact that compliance with the requirement might render the machine unusable did not absolve the company from its duty to fence securely. The company was appealing against a decision of the Court of Appeal, which reversed a judgment of Mr. Justice Jones.

In the case the plaintiff was Albert Harold Frost, of Connah's Quay (Flintshire). Frost, an experienced maintenance fitter, was grinding a piece of metal at the defendants' steelworks, when he suffered an injury to his right thumb by contact with the grindstone, which was revolving at about 1,450 r.p.m. The upper part of the machine was guarded by a fixed guard or hood and at the base there was an adaptable tool rest, but a portion of the stone was left unguarded.

Their lordships also held that the plaintiff had not been contributorily negligent, a finding from which Lord Oaksey and Lord Morton of Henryton dissented.

Woman Crane Driver Awarded £750

An award of £750 damages with costs was made at Leeds Assizes to Mrs. Clarice Herbert (60), of Sitwell Avenue, Garden Village, Stocksbridge, against her employers, Samuel Fox & Company, Limited. It was stated that Mrs. Herbert was employed as a crane driver and was involved in an accident at the company's steelworks on September 3, 1953. She was climbing a steel ladder when she fell to the floor of the factory. It was alleged that the platform to which she had to climb was not safe. She had been operating the crane for the past 10 years.

Mr. G. F. Leslie, for Samuel Fox & Company, denied negligence and claimed that Mrs. Herbert failed to place her foot firmly on the platform when she reached the top of the ladder and did not look where she was going.

Mr. Justice Byrne said it was vital and essential that the defendants should have provided a handrail at the top of the ladder. Mrs. Herbert was now only able to do light work and in consequence would lose £1 10s. per week as compared with the wages she received as a crane driver.

PLANS have been approved for rebuilding part of the Crown Works, Pallion, Sunderland, of Steel & Company, Limited, engineers, which recently sustained damage by fire.

Coal-dust, Pitch and Wood-flour

In a paper which Mr. P. Nicholas presented to the *Association Technique de Fonderie* he reviewed in some detail the results obtained from a series of researches and practical tests as to the influence of coal-dust, pitch and wood-flour on green- and dry-sand moulding. Below are set out the author's main conclusions:—

Coal-dust

The incorporation of coal-dust into moulding sand presents no difficulties, as it mixes quite easily. From the foundry angle, it is first essential to stress the definite reduction in permeability when coal-dust is used with certain sands of low clay content. It is thus necessary to limit the amount used when working with synthetic sand where high permeability is a prime requisite. Tests have been recorded in two distinct fields from the angle of strength:—

Green-sand moulding.—Here it is easy to be mistaken about the action of coal-dust, for if it increases the green-sand strength as well as the hot-strength of sands with low or average clay content, it lowers the latter at the lower temperatures. The presence of coal-dust in abundance, especially in relation to the clay content, certainly confers a sufficient "green" coherence, but when hot this rapidly disappears.

Dry-sand moulding.—In this field use is often made of sands of high-clay content which give good hot-strength, but this quality is materially reduced by coal-dust. Furthermore, in the making of large castings there is a possibility of disintegration, as the mould can be the source of gas evolution. Thus, the use of a sand carrying coal-dust in this field is dangerous for the very reason that dry-sand moulding is chosen from the viewpoint of avoiding gas evolution. It is therefore important carefully to separate green-sand from dry-sand moulding in any foundry operating the two processes.

For the sake of completeness, it should be pointed out that coal-dust combats to a large extent defects due to the expansion of silica, and helps to promote ease of stripping.

Pitch

It is more hygienic to use granulated pitch than coal-dust, but its incorporation in sand is more delicate for the following two reasons: (1) Only a small addition of the order of 1 per cent. is required, and (2) pitch being of a greasy nature, mixes only with difficulty with damp sand. Some of the drawbacks to the use of pitch are solely due to the fact that its incorporation is desired in a continuous sand system where obviously intimate mixing cannot be assured. In this case it is necessary to arrange for the homogeneous pre-mixing of new dry sand and pitch, which might usefully conform to the following proportions:—

New, dry sand	..	100 parts by weight
Pitch	.. ..	1 to 1.2 parts by weight

Mixtures containing larger amounts than 1 per cent. are prepared for the purpose of replacing losses of pitch during use. This is the mixture recommended for use with the systems and in continuous sand plants. The pitch reduces permeability of the sand but slightly. For a sand carrying 15 per cent. of clay, having an AFS permeability number of 45, the latter property is reduced by 10 per cent. where there is an incorporation of 1 per cent. pitch as against 40 per cent. with a 5 per cent. addition of coal-dust.

On the other hand, pitch does not modify the green-strength of a sand but increases the dry-strength (when the temperature reached during stoving is correct). It also increases the hot-strength and does this without altering the position of the maximum strength along the temperature scale. Difficulties due, for example, to excessive washing of the sand at the ingates, will not be experienced with pitch as is sometimes the case with coal-dust.

Conversely, it would not appear that pitch normally facilitates ramming operations, yet it does safeguard against defects of the "scab" type to a greater degree than coal-dust.

Wood-flour

This material is clean to use and easy to incorporate in sand, but it is preferable to saturate the flour with water before mixing because when added in the dry state it swells too slowly in the prepared sand and on occasions insufficiently quickly to prevent scabbing.

Wood-flour does not sensibly alter the green-strength of the sand. On the other hand, a 1 per cent. addition sharply reduces both the dry- and hot-strength. It is therefore necessary to take great care with the runner systems and ingates of moulds containing wood flour additions. Similarly, this is the material to be chosen in the case where special ramming quality is sought and above all when a sand liable to expand is being used.

South Wales Ports Trade

From January 1 to March 28 this year trade handled at the South Wales ports of Cardiff, Swansea, Newport, Barry, Port Talbot, Penarth, and Briton Ferry, amounted to 4,647,291 tons, compared with 5,072,155 tons in 1954, a drop of 424,864 tons. Imports declined from 2,387,708 to 2,237,746 tons, while exports dropped from 2,684,447 to 2,409,545 tons.

There were heavy falls in both inward and outward traffic handled at the ports in the four weeks ended March 28 compared with the corresponding period of last year. The total traffic dealt with amounted to 1,653,785 tons, which was 249,405 tons below that of the 1954 period. Inwards cargoes, at 815,848 tons, decreased by 99,095 tons, and exports, which totalled 837,937 tons, showed a decline of 150,310 tons.

During the three months' period an import of 82,711 tons of foreign coal was recorded, against nil in the same quarter a year ago. Iron-ore arrivals totalled 566,715 tons, against 667,435 tons. Imports of iron and steel goods recorded 125,144 tons from abroad and 37,300 tons coastwise, compared with 91,471 and 24,037 tons, respectively.

Tinplate cargoes for foreign destinations were up by 11,000 to 74,441 tons, but iron and steel goods exports were down from 93,263 to 82,087 tons.

Imports and Exports of Iron and Steel in February

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in February. Totals for the first two months of this year and the last are also included.

Total Exports of Iron and Steel

Destination.	Month ended February 28.	Two months ended February 28.	
	1955.	1954.	1955.
	Tons.	Tons.	Tons.
Channel Islands	694	759	1,387
Cyprus	464	732	643
Sierra Leone	735	2,747	1,119
Gold Coast	2,931	6,691	4,814
Nigeria	3,241	9,004	7,521
Union of South Africa	7,445	6,755	17,392
Rhodesia and Nyasaland	4,729	5,452	7,060
Tanganyika	1,125	1,965	2,094
Kenya	2,353	13,712	6,106
Uganda	743	1,445	984
Mauritius	148	1,447	337
Bahrein, Qater, and Trucial Oman	978	6,681	1,525
Kuwait	492	1,884	764
India	13,367	13,777	23,322
Pakistan	9,863	6,706	15,631
Singapore	2,473	6,641	8,096
Malaya	1,539	3,320	2,890
Ceylon	1,327	2,907	3,163
British North Borneo	102	679	532
Hongkong	4,064	3,383	7,429
Australia	41,092	30,771	83,275
New Zealand	20,404	23,564	47,145
Canada	6,899	20,522	13,666
Jamaica	896	1,753	2,369
Trinidad	4,063	6,543	10,924
British Guiana	288	810	756
Anglo-Egyptian Sudan	1,169	4,338	2,929
Other Commonwealth countries	4,137	4,182	6,653
Eire	3,949	7,040	8,537
Finland	7,293	6,337	14,234
Sweden	11,615	13,549	26,153
Norway	10,285	15,411	20,536
Denmark	8,305	15,766	16,250
Western Germany	532	746	1,612
Netherlands	8,233	17,164	19,180
Belgium	2,584	1,635	3,742
France	382	821	960
Switzerland	1,451	1,251	2,743
Portugal	932	1,862	1,587
Spain	492	649	1,532
Italy	1,957	9,374	4,211
Austria	286	95	408
Yugoslavia	1,347	410	3,669
Turkey	1,371	1,416	2,323
Netherlands Antilles	494	859	1,039
Portuguese E. Africa	166	428	320
Lebanon	49	178	92
Israel	1,231	1,350	1,989
Egypt	5,100	4,839	8,313
Saudi Arabia	1,637	537	2,244
Iraq	1,716	5,653	2,816
Iran	4,180	796	8,172
Burma	612	1,233	1,983
Thailand	198	782	1,102
Indonesia	314	1,522	473
Philippine Republic	594	506	968
USA	2,058	3,821	7,873
Colombia	552	1,161	1,790
Venezuela	5,364	3,598	15,192
Ecuador	496	674	572
Peru	512	679	1,741
Chile	94	296	248
Uruguay	933	2,693	1,978
Argentina	3,155	9,172	7,766
Other foreign countries	3,552	12,253	9,141
TOTAL	231,782	335,727	484,015

Total Imports of Iron and Steel

From	M'th ended Feb. 28.	Two months ended February 28.	
	1955.	1954.	1955.
	Tons.	Tons.	Tons.
Australia	—	5,896	6
Canada	8,598	26	9,701
Other Commonwealth countries and Eire	466	1,030	761
Soviet Union	18,101	19,971	27,054
Sweden	2,895	8,035	4,820
Norway	7,223	3,799	12,520
Western Germany	1,696	10,653	2,496
Netherlands	7,266	18,303	15,824
Belgium	5,119	10,142	11,823
Luxembourg	2,416	5,069	3,807
France	6,532	21,177	12,003
Italy	34	29	67
Austria	21,518	45,592	24,054
Japan	494	15	1,159
USA	32,294	18,597	57,641
Other foreign countries	17	123	67
TOTAL	114,669	168,457	183,803
Iron and steel scrap and waste, fit only for the recovery of metal	80,934	117,112	184,708

Exports of Iron and Steel by Products

Product.	M'th ended Feb. 28.	Two months ended February 28.	
	1955.	1954.	1955.
	Tons.	Tons.	Tons.
Pig-iron	5,033	1,784	10,140
Ferro-columbium (niobium)*	32	—	35
Ferro-tungsten	15	63	40
Other ferro-alloys†	216	566	382
Ingots, blooms, billets, slabs, sheet and tinplate bars	563	1,107	1,306
Iron bars, rods, angles, shapes, and sections	237	341	714
Steel bars, rods, angles, sections, and shapes	40,520	42,130	80,547
Iron plates and sheets	19	268	27
Universal plates	326	1,162	1,004
Steel plates, ⅛ in. and under ¼ in.	1,457	1,999	2,809
Do. ¼ in. and over	26,855	23,344	54,029
Black sheets and black plate	18,016	31,377	40,937
Hoop and strip	11,563	17,172	20,862
Tinplate	20,705	43,902	55,660
Tinned sheets, terneplate, and ternesheets	121	357	372
Decorated tinplate	264	388	656
Galvanized sheets	13,037	25,831	26,599
Other coated plates and sheets	1,054	997	2,220
Railway and tramway construction material	20,599	35,878	39,410
Wire rods	2,522	4,921	5,379
Wire	8,405	9,307	19,230
Tubes, pipes, and fittings	59,751	89,286	119,236
Iron castings	128	1,974	1,594
Steel castings	77	903	240
Forgings	267	660	587
TOTAL	231,782	335,727	484,015

* Not separately distinguished before 1955.

† The figures for 1955 are not completely comparable with those for previous years.

THE STAFFORD LOCOMOTIVE FIRM of W. G. Bagnall, Limited, plan to build more Diesel engines, and at present over half the manufacturing capacity is allocated to this type of engine.

FORD MOTOR COMPANY, LIMITED, has had plans approved for the erection of the first instalment of a foundry and cooling towers at New Road, Rainham, Essex.

Book Review

"Shell Molding and Shell Mold Castings," by T. C. Du Mond; published by Chapman and Hall, 37, Essex Street, London, W.C.2. Price 16s. net.

In his foreword the author disclaims any intention of telling the reader how to set up a shell-moulding foundry. His aim, he says, is to let the potential user of the process know what he can expect of it. The advantages of the process have been quite adequately set out in general terms but the examples of typical shell-moulded castings given in the latter half of the book are not accompanied by enough data to be of much value. On dimensional tolerances and on the size of batch economically worth-while, the author is necessarily vague.

It is when he deals, in spite of his foreword, with the production details of the process, that he is most unsatisfactory. For example, on page 34 he states that no method of sand reclamation has yet been devised; yet at least three firms in this country market equipment for the purpose. On page 53 it is stated that the expansion of the hot pattern must be accurately known so that shells can be made of the proper size. Six pages later we read that it is not necessary to allow for pattern expansion at the operating temperature. Other examples of this sort could be given.

Even allowing for the gaps in knowledge which must necessarily exist in a comparatively new process, this is a disappointing book. J.L.R.

Publications Received

Heads and Threads. Buyers' Guide, published by the British Bolt, Nut, Screw and Rivet Federation. Joint secretaries: Heathcote and Coleman, 69, Harborne Road, Edgbaston, Birmingham, 15, and Peat, Marwick, Mitchell & Company, Queens Square, Middlesbrough.

The Federation issuing this brochure has nine constituent associations, one of which is the Wood Screw Manufacturers' Association. It is probably in this section that the foundry buyer will use it most as a source of supply. Not only is this a buyers' guide, but it also includes the germane BS specifications. The bulk of the book is devoted to advertisements.

Bulletin and Foundry Abstracts of British Cast Iron Research Association; Vol. 12, No. 11; March, 1955, published by the Association from Alvechurch, Birmingham.

This issue contains a most useful bibliography on plastic patterns. There are 19 references and the searcher for information, after studying merely those most readily available to him, should acquire as much information as would be given in a textbook on the subject. The rest of the issue is made up of abstracts, subdivided in the habitual manner and, as usual, exceptionally well compiled.

Italy (an overseas economic survey) by E. J. Joint, C.M.G., O.B.E. Published by Her Majesty's Stationery Office. Price 4s. net.

This publication ranks high amongst those appearing in this series of Overseas Economic Surveys. Primarily it is essentially readable and enables one to have a very clear picture of the possibilities of business. The book stresses the importance of the recent exploitation of natural gas in industry; the industrial development of the North and the need for capital in the South to bring about a better balanced economy. The foundry industry has not received separate treatment.

Expansion in Electrical Engineering

There has been a tendency in the past for the demand for electrical energy to double every 10 years. That trend, subject to interruptions, is likely to continue, and it is on this supposition that Associated Electrical Industries, Limited, is basing its future policy. In his review for the year 1954, the chairman, Lord Chandos, says that the organization now has more than 12,000,000 sq. ft. of manufacturing space, but this is inadequate to deal with the volume of business which is expected to flow to it in the next few years. The company is undertaking large schemes of expansion, including new blading and turbine works at Larne, in Northern Ireland, and also intends establishing a small factory in the Highlands of Scotland, to employ mainly women, in order to help stem some of the drift from the Highlands to the industrial areas.

Speaking of new financial arrangements, Lord Chandos announces that the group intends to pay quarterly dividends, and to issue a six-monthly progress report. The object of the quarterly dividend is to aid the small investor over his family budget, and to help stockholders follow the course of the business. Lord Chandos says also that a scheme whereby workpeople can purchase shares and thus participate in the ownership of the group is being introduced.

Since 1945 productivity within the AEI group has risen twice over without any significant rise in labour. The value of production last year totalled £96,000,000, compared with £86,000,000 in the previous year. During 1954 the organization spent more than £4,500,000 on research and development of new processes, products, and new lines of manufacture.

Particular reference is made in the chairman's report to the need for increasing the recruitment of graduates, scientists, and technicians for industry and of training sufficient numbers of these for future needs. This, it is stated, is a problem of vital national importance. AEI is making strenuous efforts to improve its own position in this direction, and there are now over 4,000 apprentices undergoing training in the organization's educational departments.

Recent Wills

MILLINGTON, ERNEST, formerly chief metallurgist of the LMS Railway at Derby	£7,884
CHAMBERLAIN, J. E., chairman and joint managing director of Switchgear & Cowans, Limited, Manchester	£14,159
SCHMIDT, J. W., chairman of William Ayrton & Company, Limited, textile-machinery manufacturers, of Manchester	£158,844
CHAPMAN, HARRY, founder and managing director of the Chapman Engineering Company (Manchester), Limited	£17,400
KAY, ALDERMAN SIR WILLIAM, three times Lord Mayor of Manchester, and deputy chairman of the Manchester Ship Canal Company	£7,936
SMETHURST, J. E., joint managing director of James Smethurst & Son, Limited, engineers and iron-founders, of Warrington (Lancs)	£37,888
HODGSON, R. B., formerly general manager and a director of Ashmore, Benson, Pease & Company, Limited, manufacturers of blast-furnace plant, of Stockton-on-Tees	£22,564
CLAPHAM, F. W., an executive director of Clapham Bros., Limited, gas plant manufacturers, of Keighley (Yorks), and a director of John Lund, Limited, machine-tool manufacturers, of Keighley	£37,573
DE PAULA, F. R. M., chartered accountant, formerly a director of the Brush Electrical Engineering Company, Limited, Powers-Samas Accounting Machines, Limited, and other companies, former controller of finance of the Dunlop Rubber Company, Limited, and chairman of the taxation committee of the Federation of British Industries	£48,499

Company News

ENFIELD ROLLING MILLS, LIMITED—A final dividend of 15 per cent., making 20 per cent. for the year ending December 31, 1954, is recommended, against 10 per cent. Consolidated trading profit reached £1,367,328, compared with £695,734.

G. & J. WEIR, LIMITED, engineers and founders, of Glasgow—A 2½ per cent. diamond jubilee bonus is being paid in addition to the final dividend of 20 per cent., making 27½ per cent., previously announced. Last year's distribution totalled 21 per cent.

SAMUEL OSBORN & COMPANY, LIMITED—On account of the year to July 31 the directors are declaring an interim dividend of 12½ per cent., against 10 per cent. in the previous year, but the increase does not necessarily imply a higher total distribution, they state.

LONDON ALUMINIUM COMPANY, LIMITED—The board announces an ordinary dividend of 7½ per cent. for 1954, against a dividend of 10 per cent. and a bonus of 5 per cent. Consolidated trading profit amounted to £109,869, compared with £147,611 in the previous year.

BRITISH ELECTRIC RESISTANCE COMPANY, LIMITED—The directors announce a 5 per cent. interim dividend on account of the year to July 31, against 2½ per cent. last year. They say that the increase should not be regarded as indicative of any increase in the total distribution for the year.

WORTHINGTON-SIMPSON, LIMITED, pumping machinery manufacturers, of Newark (Notts)—A final dividend of 10 per cent., making 20 per cent. for the year to December 31, 1954, on capital increased by a one-for-12 scrip issue, is announced, the same as on the old capital. Net profit amounted to £282,112, against £224,996.

C. & W. WALKER, LIMITED, gasworks engineers and ironfounders, of Wellington (Salop)—Group net profit for the year to January 31 last totalled £36,057 against £37,571 in the previous year. An ordinary dividend of 12½ per cent. on capital increased by a 50 per cent. scrip issued is announced, against 10 per cent. and a bonus of 7½ per cent. on former capital.

DANIEL ADAMSON & COMPANY, LIMITED, engineers and boilermakers, of Dukinfield (Ches)—A final dividend of 9½ per cent. is recommended, making 12½ per cent. for the year ending December 31, 1954, on capital increased by a three-for-five scrip issue, compared with 20 per cent. on the old capital. Profit amounted to £232,127, against £256,650.

GLOVER & MAIN, LIMITED, gas engineers, of London, S.W.1—A final distribution of 3s. 6d. per share, plus a bonus of 1s. per share, is announced, making 5s. 6d. per share on capital increased by a one-for-11 scrip issue for the year ended December 31, 1954, against dividends totalling 3s. per share, plus a bonus of 1s. 6d. per share, on the old capital. Group net profit, before tax, amounted to £783,671, against £579,614.

Board Changes

A. & S. HENRY & COMPANY, LIMITED—Mr. E. Brennan has ceased to be a director.

MECHANS, LIMITED—Mr. Austin Walker, a director and formerly secretary, has been appointed managing director.

WADKIN, LIMITED—Mr. John Bullivant, who has joined the board as an additional director, is also to be acting chairman during the illness of Sir Holland Goddard.

KELVIN & HUGHES, LIMITED—Mr. F. A. King and Mr. A. J. Hughes have retired from the board, to which Mr. F. W. Bates, general works manager, has been appointed.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade, Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone CHAncery 4411, ext. 738 or 771), unless otherwise stated.

CANADA, April 29—Ash-handling plant, for the Manitoba Hydro-Electric Board. (ESB/7611/55.)

CLITHEROE (LANCS.), April 22—Electrically operated pumping plant (duplicate pumps), for Bowland Rural District Council. Arnold Brooksbank, consulting engineer, General Buildings, 48, Sunbridge Road, Bradford, 1, Yorks. (Deposit, £3 3s.).

EGYPT, June 21—Gas producer plant, for the Cairo City Electricity and Gas Administration. (ESB/7680/55.)

FORMOSA, May 4—Overhead travelling crane, for the Central Trust of China, US Aid Division. (ESB/7304/55.)

INDIA, June 22—Indoor and outdoor switchgear and power transformers for the sub-stations proposed under the Periyar hydro-electric scheme, for the Superintending Engineer, Technical (Electrical), Madras. (ESB/7514/56.)

IRAQ, May 3—Cables and cable boxes, for the Directorate-General of Municipalities, Bagdad. (ESB/7709/55.)

IRAQ, May 10—Cables and cable boxes, for the Directorate-General of Municipalities, Bagdad. (ESB/7708/55.)

IRAQ, June 15—Diesel generating plant, for the Director-General of Municipalities, Bagdad. (ESB/7707/55.)

LONDON, S.W.1, May 18—Vertical and horizontal pumping plant for sewage sludge and effluent, for Middlesex County Council. The Chief Engineer, Middlesex County Main Drainage Department, PO Box No. 7, Isleworth.

PORTUGUESE EAST AFRICA, June 24—Various hand tools, for the Ports, Railways, and Transport Department, Lourenço Marques. (ESB/7300/55.)

SOUTH AFRICA, April 28—Electric travelling hoist, for the Union Tender and Supplies Board. (ESB/7565/55.)

SOUTH AFRICA, May 4—Electrical cable, for the Stores Department of the South African Railways. (ESB/7553/55.)

SOUTH AFRICA, May 4—1,300 ft. of insulated cable, for the Stores Department of the South African Railways. (ESB/7552/55.)

SOUTH AFRICA, May 5—Self-propelled mobile crane, for the Stores Department of the South African Railways. (ESB/7665/55.)

SOUTH AFRICA, May 6—Watt-hour meters, for the Corporation of Durban Electricity Department. (ESB/7481/55.)

Increases in Capital

PROJECTILE & ENGINEERING COMPANY, LIMITED, London, S.W.8, increased by £200,000, in 10s. ordinary shares, beyond the registered capital of £550,000.

SERCK RADIATORS, LIMITED, Birmingham, increased by £750,000, in 370,000 ordinary and 375,000 unclassified shares of £1, beyond the registered capital of £750,000.

R. W. CRABTREE & SONS, LIMITED, printing machinery makers etc., of Leeds, increased by £699, 750, in £1 ordinary shares, beyond the registered capital of £800,250.

GEORGE TUCKER & COMPANY (SHEFFIELD), LIMITED, metal merchants and manufacturers, etc., increased by £20,000, in £1 ordinary shares, beyond the registered capital of £10,000.

THOMAS WHITTINGTON & SONS, LIMITED, brassfounders, copper rollers, metalworkers, etc., of Cannock (Staffs), increased by £23,000, in £1 ordinary shares, beyond the registered capital of £12,000.

JOHN BROWN & COMPANY, LIMITED, increased by £2,700,000, in 2,233,234 ordinary shares of £1 and 4,667,660 4½ per cent. cumulative preference shares of 2s., beyond the registered capital of £6,300,000.

VARLEY PUMPS & ENGINEERING, LIMITED, London, E.C.2, increased by £29,049 18s. in 10,000 ordinary shares of £1 and 3€2,558 ordinary shares of 1s. each, beyond the registered capital of £20,950 2s.

VILLIERS ENGINEERING COMPANY, LIMITED, Wolverhampton, increased by £500,000, in 250,000 cumulative preference shares of £1 and 1,000,000 ordinary shares of 5s. each, beyond the registered capital of £500,000.

A. & W. H. BURY (DARWEN), LIMITED, engineers, etc., of Darwen (Lancs), increased by £25,000, in £1 ordinary shares, beyond the registered capital of £20,000. Oxley Engineering Company, Limited, holds all the issued shares.

P. A. M., LIMITED, manufacturing engineers, of London, S.W.1, increased by £30,000, in £1 ordinary shares, beyond the registered capital of £30,000. At May 4, 1954, Southern Areas Electric Corporation, Limited, held a majority of the issued shares.

ZWICKY, LIMITED, general engineers, ironfounders, etc., of Slough (Bucks), increased by £70,000, in £1 ordinary shares, beyond the registered capital of £35,000. At November 30, 1954, G. & J. Weir, Limited, Glasgow, held a majority of the issued shares.

News in Brief

PURIMACHOS LIMITED, are now represented in Scotland, Northumberland and Durham by Mr. J. M. Little, 50, Kethers Street, Motherwell.

A MAJORITY INTEREST has been acquired in the equity of W. R. Skinner, Limited, valvemakers, etc., of London, E.16, by G. & J. Weir, Limited, engineers and ironfounders, of Glasgow.

THE 200 MEN suspended at the Imperial Tubeworks of Stewarts and Lloyds, Limited, Airdrie, because of shortage of steel, resumed work on April 12. Only one section of the works was affected.

G. & J. WEIR, LIMITED, has been granted permission to erect a research building comprising offices, laboratory and experimental workshops, plus an addition to a workshop bay, at Holm Foundry, Cathcart, Glasgow.

MUREX, LIMITED, manufacturers of carbon-free metals and alloys, of Rainham (Essex), has disposed of its minority holdings in Hard Metals, Limited, Transvaal, to the Anglo-American Corporation of South Africa.

A NEW CONTINENTAL TOURING SERVICE for Rover car owners, which includes a "travellers' cheques" system for meeting repairs bills without dipping into the basic travel allowance, has been introduced by the Rover Company, Limited.

A VANCOUVER trade mission with a purchasing power of up to £2,500,000 is visiting Britain. The delegation will spend 11 days canvassing the possibility of increasing trade with Western Europe and the transfer of factories from Britain to British Columbia.

THE ACTIVITIES of T. Mitchison, Limited, ship repairers, of Gateshead, have been extended to ship building, as the business of repairing small vessels has been falling off. A motor tug for a firm in Aden is already under construction on a slipway at the company's yard.

A "CAREERS EXHIBITION" sponsored by Chesterfield Rotary Club, was held in Chesterfield, last week. Trades and industries on show included electrical, mechanical, and motor engineering. Some of the large local firms combined to display foundrywork, and patternmaking, etc.

THE MINISTRY OF PENSIONS AND NATIONAL INSURANCE, 10, John Adam Street, London, W.C.2, have issued a booklet "Everybody's Guide to National Insurance." It costs 6d. and is on sale at the local offices of the Ministry and Government Bookshops.

CVA JIGS, MOULDS & TOOLS LIMITED, Portland Road, Hove, Sussex, has plans for the erection of new factory premises on an eight-acre site at Lineside Industrial Estate, Littlehampton, Sussex. The new premises will include a grey-iron foundry, along with machine, fitting, welding and assembly shops.

THE LARGEST TONNAGE of miscellaneous goods to be dealt with at Swansea Docks in a single week in post-war years totalled 35,083. Imports amounting to 23,457 tons included scrap, zinc concentrates, pig-iron, pitwood, sulphur, and aluminium. Exports, at 11,626 tons, were composed mainly of tinplate and miscellaneous goods.

IN THE ANNUAL REPORT of the Derby Technical College Staff Council for 1954, it is revealed that 8,000 students attended the College last year, and that 1,571,000 hours were spent in study, which has established a record. It is proposed to erect a new Technical College in Derby in the near future to meet the needs of students.

THE RENISHAW IRON COMPANY, LIMITED, has written to the Chesterfield Rural Council housing manager, Mr. G. R. Jennings, stating that houses are urgently required for 25 of the firm's "key" employees. The letter adds that this number will shortly be increased to 35. The letter has been passed to the Council's Housing Committee for consideration.

THE IDEAL SAUCEPAN was the theme of the *formes utiles* (useful shapes) competition organized by the French *Salon des Arts Mènagers*, and the saucepans submitted were shown at the French Ideal Homes Exhibition opened recently at the Paris *Grand Palais*. The saucepan adiudged nearest to perfection was made of aluminium with a copper bottom and plastics handle.

EYRE SMELTING COMPANY, LIMITED, have just issued a calendar, running from April, 1955, to March, 1956, thereby showing a wish to be different from the average, which is always good publicity. The calendar records London sporting events appropriate to the months and printed on its reverse is a diary of events for this vear and a record of winners in previous years, since 1950.

THE APPOINTMENT is announced of Howard Houlder & Partners, Limited, London, E.C.3, as United Kingdom agents for James Brown, Limited, Durham, Natal. Capt. P. St. Pierre has been delegated to undertake the duties involved. James Brown owns and operates iron and brass foundries and has a plate shop with the largest plate bending rolls in South Africa, while ship repairing is an essential part of the business.

SAFETY STEWARDS have been appointed in all departments of the Steel, Peech & Tozer Branch of the United Steel Companies, Limited, Sheffield, as part of a campaign to cut down works accidents. One of their jobs will be to watch for the causes of mishaps and point them out to workmates. The stewards will wear badges so they can be recognized, and the company is organizing a competition among employees to find the best design.

BY 1960, Imperial Chemical Industries, Limited, at Billingham and Wilton, and Dorman, Long & Company, Limited, at New Lackenby, will be using more water than the city of Portsmouth needs for its 250,000 people, said Alderman C. W. Allison, chairman of the Tees Valley Water Board, at the inauguration of a pumping and filtration plant at Broken Scar, Darlington. The plant, which has cost £750,000, will yield 20,000,000 galls. of water a week.

DAVID BROWN TRACTORS (ENGINEERING), LIMITED, dispatched tractors and equipment valued at more than £1,000,000 during the month of March. This was a new production record and the first time in the company's history that the monthly output value has exceeded £1,000,000. Many of the tractors built during March are being shipped to the Argentine as part of a £250,000 contract. A tractor will be among the local products on display when Industrial Sunday is observed at Holmforth Parish Church on May 1. It has not been possible before because the church doors are not wide enough to admit an agricultural tractor, but this year David Brown Tractors (Engineering), Limited, are sending the pieces and the tractor will be assembled inside the church.

THE SUCCESSFUL SEARCH of manufacturers of steelmaking refractories in this country for a silica brick of low porosity and with a low flux content was outlined in Glasgow on April 15 by Mr. H. Parnham, of General Refractories Limited, to the West of Scotland Iron & Steel Institute. Concentrating on indigenous

News in Brief

raw materials the manufacturers ran tests on a two-year pilot plant. These proved successful and a full-scale works plant has now been completed and is in production.

IT IS ANTICIPATED by the Phosphor Bronze Company, Limited, Birmingham, that their new £350,000 building scheme will be completed by August. When the firm moved from their three existing works in Aston, Witton and London into the bomb-shattered factory previously owned by Fisher & Ludlow Limited, they set out to create an ideal factory using all applicable new developments as they became available. One of the most recent introductions is gamma-ray equipment for testing castings.

THE PART of industry in civil defence was stressed by Mr. George Hutchinson, principal officer for the Northern Region of the Home Office's Civil Defence Department, when he spoke to the Northern Regional Board for Industry in Newcastle-upon-Tyne. Mr. Hutchinson said that since June, 1951, 204 of 439 firms in Northumberland, Durham, Cumberland, Westmorland, and the North Riding of Yorkshire who were invited, had taken steps to organize civil defence for their own premises.

THE NEW £250,000 WORKSHOP built by Belliss & Morcom Limited at their Ledsam Street, Birmingham, works, which is claimed to be among the most modern shops of its kind, was visited on April 14 by the Lord Mayor and Lady Mayoress of Birmingham who gave civic recognition to the extension. The new workshop provides an extra floor area of 56,000 sq. ft. It is heated by direct radiation from steam heated panels set in the roof or high on the walls and skylights and fluorescent fittings provide daylight lighting.

AT STAND 117 at the Physical Society's Exhibition, to be held in the New Horticultural Hall, April 25 to 28, Mullard Limited, will stage a number of interesting exhibits, including demonstrations of ultra-high-speed photography, high-speed counting, transistor circuits, high-speed digital computing elements, particle counting, new magnetic materials, pulse generators and oscilloscopes, and microwave measuring instruments. In addition, there will be examples of the latest Mullard valves tubes and transistors.

A COMMITTEE has been formed in the Wolverhampton area to deal with the recruitment and training of youths for the engineering industry. It has Mr. H. J. SILVESTER, personnel manager of the Villiers Engineering Company, Limited, and Mr. H. RILEY, an official of the National Society of Metal Mechanics, as joint secretaries, and Mr. F. CLAPHAM, Wolverhampton district secretary of the AEU as chairman. The committee has recently arranged for visits to factories in the area by the careers masters of local schools to see the conditions that will be facing school-leavers.

AYRSHIRE EDUCATION COMMITTEE have decided to depart from the decision merely to extend Ayr Technical College and, instead, to follow a policy of first supplementing the present accommodation and then gradually replacing the existing buildings. The first stage will be the erection of a new wing on ground recently acquired, with heavy instructional engineering equipment installed on the ground floor. The present Grammar school annexe and College gymnasium will be retained as parts of the College, and the present main buildings of the College will ultimately be demolished and replaced.

A SECOND ORDER worth $20 million for the Nash Metropolitan has been received by the Austin Motor Company, Limited, which builds the car in Birmingham for the American Motor Corporation. The original order placed last year by the Nash Kelvinator Corporation (now the AMC) was for 20,000 Metropolitans. The second order is for the same again. So far $14 million has been earned. Austins expect to complete the first order this summer; production is at the rate of 200 a week. The car has proved an unqualified success even though its 1,200 cc engine and three-speed gear-box make it far smaller than its competitors.

FIVE THOUSAND TONS of lead ore have been extracted from the new lead mine sunk at Starkholme, near Matlock, Derbyshire, three years ago. Reporting this on April 7, Mr. John Hadfield, chairman and managing director of Derbyshire Stone, Limited, stated that the exploration for lead and zinc ores in the Matlock area has been continued during the past 12 months. There has been considerable extension in the main drive at the Starkholme mine. The responsibility for the project of reviving the ancient lead mining industry in Derbyshire has been assumed by the Rio Tinto Finance and Exploration, Limited, through an operating company known as the Matlock Lead Mines, Limited, with which Derbyshire Stone is associated.

A WARNING to traders about possible delivery problems which may arise with the installation of parking meters and parking places outside their premises is given by Mr. F. D. Fitz-Gerald, National Secretary of Traders' Road Transport Association, organization for "C" licence operators. He says, in the Association's monthly *Bulletin*, that if the Road Traffic Bill becomes law with the present provisions on this subject unchanged "it will be essential for all closely to watch for announcements of proposals to instal parking place and/or parking meters and to contest such proposals if they are likely to take away the right of access to premises." In his view there does not appear to be "adequate protection against interference with the right of access—a protection which is given in the Road Traffic Act, 1930, in respect of road restriction orders."

A RUMOUR that the North British Locomotive Company, Glasgow, was being taken over was denied by an official last week. The rumour followed a rise in the firm's shares at Glasgow Stock Exchange. A more likely reason for the shares spurt is that the British Transport Commission are soon likely to announce details of contracts placed under their £1,200,000,000 modernization scheme. It can be assumed that the Glasgow locomotive builders will receive a share of this valuable programme. For some time past they have been engaged in the development of a new Diesel division and have been recruiting technicians for this type of work. An official of the firm said the diesel development had now been completed and that they would be able to cope with any work which might come their way. Until now the company have been engaged almost entirely on the production of steam locomotives.

New Shipbuilding Orders

In the first quarter of 1955 licences were issued to British shipyards for 60 vessels totalling 214,297 gross tons, compared with licences for 50 vessels totalling 83,647 gross tons in the first quarter of last year.

This was announced by Mr. S. Wingfield Digby, Civil Lord of the Admiralty, recently. Mr. Digby said that licences were issued to shipyards on the North-East Coast for 15 vessels totalling 88,566 gross tons in the first quarter of this year, compared with licences for three vessels totalling 23,100 gross tons in the corresponding period a year ago.

Personal

Mr. J. GREENHORN, of Light Castings (Pty.), Limited, has been appointed chairman of the Transvaal Foundry Association.

Mr. H. S. BROOM, M.B.E., joint managing director of Broom & Wade, Limited, of High Wycombe, has recently visited Johannesburg.

Mr. GORDON KIDDOO has been elected vice-president of the development department, National Research Corporation, Cambridge, Massachusetts.

RECENTLY, LORD BELPER presented the British Empire Medal to Mr. J. W. WILSON, works engineers, of the Sheepbridge Alloy Castings, Limited.

Mr. P. L. JONES, M.C., B.SC., WH.EX., has been elected to succeed Mr. R. W. BAILEY as president of the Institution of Mechanical Engineers.

Dr. JOHN CHIPMAN, D.SC., PH.D., head of the Department of Metallurgy of the Massachusetts Institute of Technology, has been awarded the Bessemer Gold Medal, 1955, by the Iron and Steel Institute.

A YORKSHIRE SECTION of the Institute of Materials Handling has been inaugurated. Mr. A. W. FAWKE, of the Laycock Engineering Company, Limited, Sheffield, has been appointed chairman. Mr. A. GERRARD is vice-chairman, and Mr. D. A. ANDERSON, of Rotherham, is secretary and treasurer.

Mr. AUSTIN WALKER, C.A., Motherwell, has been appointed managing director of Mechans, Limited, engineers, Glasgow, whose staff he joined in 1946, when he was appointed secretary. When the company became a limited public concern a few years ago, he was invited to join the board of directors.

Mr. ERNEST HOLDEN, Midland secretary of the National Union of Manufacturers for the past six years, has resigned to take up a post in industry at the end of April. While with the NUM he supported the cause of small firms threatened with dispossession of their factories by redevelopment in Birmingham.

Mr. J. ARTHUR REAVELL opened a new chemical engineering laboratory at the University of Witwatersrand. The establishment of the laboratory has been made possible by gifts of equipment from two Johannesburg chemical manufacturing firms—W. S. Thomas & Taylor, Limited, and Kestner (South Africa) (Pty.), Limited.

Mr. JAMES BORLAND, who has retired after 54 years' service with Scottish Machine Tool Corporation, Limited, Johnstone, served his time in the patternshop of Loudon Brothers, Clyde Engineering Works, Johnstone, and took over the position of foreman in 1912. The directors presented him with a wallet of notes, while his colleagues gave him a barometer and pen-and-pencil set.

Mr. DOUGLAS J. AULT, secretary-director of Tangyes, Limited, Smethwick, has been nominated by the council of the Rotary Club of Smethwick for election as president for the club's year which opens in July. He has been a member of the club since December, 1945. He is a serving brother of the Order of St. John, a Fellow of the Corporation of Certified Secretaries, and has been a Justice of the Peace since 1950.

THE APPOINTMENT of MR. J. J. COLLETT as training officer is announced by the Council of Ironfoundry Associations, to date from May 1. He graduated from Queens' College, Cambridge, with a B.A. (HONS.) degree in 1947 and received his M.A. in 1950. Since then he has been further education officer, East Sussex County Council, deputy-director of education, International Wool Secretariat, and training officer in a large London concern.

THE UNIVERSITY OF BIRMINGHAM has announced that Professor G. V. RAYNOR has been appointed to the Feeney Chair of Physical Metallurgy. Professor Raynor became Professor of Metal Physics in 1947 and when the Department of Metallurgy was reorganized in 1954 he became joint head of the Physical Metallurgy Department with Professor A. H. COTTRELL. Professor Cottrell's resignation was announced earlier this year.

Dr. ROBERT RUSSELL, principal of Coatbridge Technical College, is to retire at the end of June. Appointed to the post in August, 1942, he has passed through his hands many students who now hold important positions in industry. A native of Wishaw, where he left school at the age of 14, he served his apprenticeship at Muirhouse Engine Works and studied at evening classes in Wishaw schools and the Royal Technical College, Glasgow. At the age of 29 he left industry to enter the day classes of the Glasgow college and gained the college diploma in mechanical engineering. In the same year he took his B.SC. in engineering at Glasgow University. His first teaching appointment was to the Royal Technical College, where he remained 17 years and was latterly a senior lecturer. During this time he did much research work.

Obituary

Mr. ROBERT FOULDS, of Renfrew, who retired three years ago after 50 years' service with Babcock & Wilcox, Limited, Renfrew, has died at the age of 69.

Mr. WILLIAM HORTON, joint managing director of Joseph Robinson & Company, Limited, Springfield Lane Iron Works, Salford, died suddenly on April 4.

THE DEATH OCCURRED in hospital recently of Coun. CHARLES A. SMITH, of Heckmondwike, at the age of 63. Coun. Smith was managing director of J. Sykes & Company, Limited, engineers and doffing plate makers, Carlton Works, Heckmondwike.

MR. T. F. BRAIME, chairman of T. F. and J. H. Braime and Sons, Limited, engineers, Leeds, died on April 5 at the age of 91. He started in business at the age of 26 and with his brother's help built up the firm until it employed 1,250 men in the 1914-1918 war.

THE DEATH is announced of Mr. STEPHEN LOOSEN, chairman and managing director of the Anti-Attrition Metal Company, Limited, Woodland Park Works, Maidenhead. He had been associated with the company for fifty years. He was a member of the Institute of British Foundrymen, having joined in 1939.

Mr. J. T. ALLEN, A.M.C.T., A.M.I.E.E., of Lancashire Dynamo & Crypto, Limited, died suddenly on April 2. He was 62. Mr. Allen had been with the company in their Trafford Park works since 1910 when he joined as an apprentice. He entered the company's service department in 1914, was for a short period in 1927 head of the contracts section and in 1928 was made head of the service department, which position he held until his death.

WE ARE INFORMED that the statement contained in the obituary notice of Mr. G. W. Booth to the effect that the deceased gentleman founded Mansill, Booth and Company is incorrect. Actually this concern was created by Mr. G. A. Mansill and the late Mr. C. T. Booth. This error is regretted and an apology is tendered.

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Weld-smoothing operations of all kinds are done better, more quickly, and more economically, by CARBOFLEX fabric-reinforced, depressed-centre wheels than by any other tool. The thousand and one other uses for these wheels include: de-scaling and de-burring, smoothing flame-cut edges, cutting sheet metal, grooving seams for welding, bevelling sheet metal, and cleaning up castings. Speeds up to 16,000 s.f.p.m. may safely be used. CARBOFLEX depressed-centre wheels are among the most versatile of all engineering tools. No foundry or welding shop should be without them.

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FABRIC-REINFORCED, DEPRESSED-CENTRE WHEELS FOR ROUGHING, SMOOTHING, GROOVING, OR CUTTING, CAST IRON, STEEL, PHOSPHOR BRONZE, MANGANESE BRONZE, ALUMINIUM, BRONZE, COPPER, MAGNESIUM BRONZE, GUNMETAL, MARBLE, AND MANY OTHER MATERIALS

THE MOST USEFUL ABRASIVE TOOL FOR FOUNDRY OR WELDING SHOP

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Raw Material Markets

Iron and Steel

Business among the foundries is much heavier than it was 12 months ago. Order-books in many sections of the trade are full, with a steady flow of new business coming to hand. The engineering and speciality foundries are particularly well situated, while most of the jobbing foundries are active. Conditions continue to be somewhat variable in the light-castings trade; most of them, however, are returning good outputs.

Supplies of high-phosphorus iron are barely sufficient to cover day-to-day requirements, while deliveries of hematite and the low- and medium-phosphorus irons are much under the required level. Another difficulty is the shortage of scrap, as a result of which larger quantities of pig-iron are being used. Producers of foundry coke generally are heavily committed, but deliveries are about equal to current needs.

The shortage of steel semis is precluding re-rollers from accepting new orders for early fulfilment; the situation is perhaps most acute in the English Midlands. There are prospects of improved deliveries from home steelworks, but the position will not be eased until supplies flow more freely. Hopes are entertained that imports of semis will shortly be considerably stepped up.

Non-ferrous Metals

The London Metal Exchange reopened last week after the Easter holiday on Tuesday, when trading was fairly active in the circumstances. Copper lost about 30s. at midday, but in the afternoon a drop of about £7 was seen as a prelude to the events of the following day, when it was announced that the Board of Trade would sell up to about 45,000 tons of electrolytic copper over the rest of the year. It was stated that arrangements for the sale of part of this tonnage had already been concluded with the Rhodesian producers and their sales agents and that discussions with the trade would take place about the disposal of the balance.

It would appear that the board intends to spread delivery evenly over the year. Further information was to the effect that the copper to be sold is from the trading stocks remaining in the Government's hands after control was brought to an end in 1953. The announcement came as a surprise, for, hitherto, the Government has refused to agree to the release of any copper from the country's stocks. There is much discussion about what prompted the authorities to take this course when to a great extent the shortage is beginning to be a thing of the past. This, of course, does not apply to Metal Exchange stocks, which are still very low. Nevertheless, the backwardation has lessened in a most satisfactory manner. After the first slump in the price to about £300, consumer buying developed and by the end of the week cash was up to £325 and three months £317. On balance, both positions lost £16.

The other metals were all firmer on the week, zinc closing 10s. up for April and unchanged forward, while lead put on 15s. and £1 for the respective positions. The cash price of tin was up £1 and unchanged forward.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* April 14, £305 to £305 10s.; April 15, £316 to £317; April 18, £315 to £336; April 19, £334 to £335; April 20, £328 to £329.

Three Months: April 14, £300 to £300 10s.; April 15, £309 to £310; April 18, £325 to £326; April 19, £325 to £325 10s.; April 20, £318 10s. to £319.

TIN, Standard—*Cash:* April 14, £715 to £716; April 15, £717 10s. to £718 10s.; April 18, £720 10s. to £721; April 19, £722 10s. to £723; April 20, £717 10s. to £718 10s.

Three Months: April 14, £716 to £717; April 15, £718 10s. to £719; April 18, £721 to £721 10s.; April 19, £723 to £723 10s.; April 20, £718 10s. to £719.

LEAD—*First half April:* April 14, £104 10s. to £104 12s. 6d. *Second half April:* April 15, £105 to £105 5s.; April 18, £105 15s. to £106; April 19, £105 10s. to £105 15s.; April 20, £104 15s. to £105.

First half July: April 14, £104 5s. to £104 10s. *Second half July:* April 15, £104 10s. to £104 15s.; April 18, £105 5s. to £105 15s.; April 19, £105 5s. to £105 10s.; April 20, £104 15s. to £105.

ZINC—*First half April:* April 14, £90 to £90 5s. *Second half April:* April 15, £89 5s. to £89 10s.; April 18, £89 15s. to £90; April 19, £89 5s. to £89 10s.; April 20, £89 to £89 10s.

First half July: April 14, £88 to £88 5s. *Second half July:* April 15, £87 15s. to £88; April 18, £88 5s. to £88 15s.; April 19, £88 to £88 5s.; April 20, £87 15s. to £88.

Overseas Trade Enquiries

Details of trade inquiries made by companies overseas concerning British manufactures are given below. Unless informed otherwise, interested manufacturers are advised to communicate (by air mail if stated) with the inquirer at the address given. At the same time they are requested to notify the local oversea representative of the UK Government, whose address is also given below, of any action taken. Any correspondence with the Export Services Branch of the Board of Trade, at Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, extension 776), should bear the appropriate BOT reference, which is quoted in parentheses at the end of each inquiry.

NATIONAL SUPPLY COMPANY, Engine Division, Springfield, 99, Ohio, USA, wishes to find a UK source of supply for molybdenum steel studs and bolts used in Diesel engines and cylinder heads. Notify the British Consulate, 1673, Union Commerce Building, Cleveland, 14, Ohio. (ESB/7606/55.)

MR. S. K. BASU, of J. C. Coondoo & Sons, 22, Raja Woodmunt Street, Calcutta, 1, India, wishes to represent UK suppliers of electric overhead travelling and traversing cranes, and underground electrical cable. Notify the UK Trade Commissioner, PO Box 9077, 1, Harrington Street, Calcutta, 16. (ESB/7478/55.)

MR. W. A. SCHULTZ, president of Industrial Tool Products, 4846, West Chicago Avenue, Chicago, Illinois, USA, wishes to secure a source of supply in the UK for a complete line of pneumatic tools of piston type, and also of rotor type in the larger sizes. Letters by air mail. Notify the British Consulate-General, 720, North Michigan Avenue, Chicago, 11. (ESB/7631/55.)

MR. STANLEY H. DAVIS, manager of the Windsor Trading Company, Limited, 940, Cote de Liesse Road, Montreal, 16, Quebec, Canada, wishes to obtain the agencies in Canada for UK manufacturers of carpenters' tools, wrenches and pliers, fastening devices, locks and hardware, metal-cutting tools, masons' and other tools. Notify the UK Trade Commissioner, 1111, Beaver Hall Hill, Montreal. (ESB/7008/55.)

IN LAST WEEK'S JOURNAL, when recording the present officials of the Council of Ironfoundry Associations two errors were made: Mr. A. E. Pearce's name was incorrectly given as Mr. Peace and Mr. Colin Gresty was omitted from membership of the Executive and Finance Committee. Apologies are tendered to these gentlemen and all who may have been confused.

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For more than 100 years ULRO have been making patterns of all types, although their speciality is, of course, patterns for gears and gear housings. ULRO are equipped to deal with all types of machine tool and general engineering patterns.

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"SCOLS" Super Iron Cement is made from the finest ingredients to rigid specification. For dealing with blow holes and other defects in foundry work, it has no equal. When set it becomes an integral part of the casting itself, having the same co-efficient of expansion as the metal upon which it is used. Withstands oil, steam or water.

Write for prices and details of packing.

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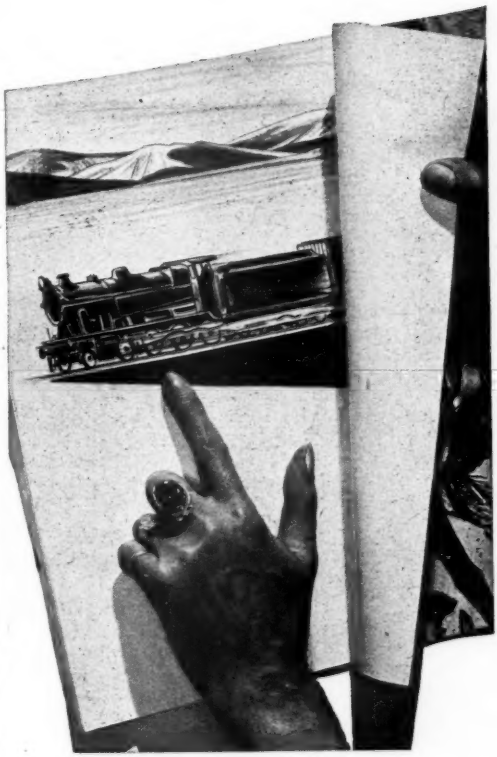

British steel builds Persia's railways

Persia wanted steel rails—100,000 tons of them for the Tabriz-Maineh and Meshed-Shahrud routes. Several European countries were keen to supply them. But the contract came to Britain. British steel and goods made from steel are in demand all over the world. Wherever there is steel there is British steel.

British steel leads the world

S.88 THE BRITISH IRON AND STEEL FEDERATION

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

April 20, 1955

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £15 12s. 0d.; Birmingham, £15 5s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £17 13s. 9d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £18 9s. 3d.

Scotch Iron.—No. 3 foundry, £18 2s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £20 4s. 0d.; South Zone, £20 6s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £21 1s. 6d.; South Zone, £21 4s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £18 2s. 6d.; Scotland (Scotch iron), £18 9s. 0d.; Sheffield, £19 7s. 6d.; Birmingham, £19 14s. 6d.; Wales (Welsh iron), £18 9s. 0d.

Basic Pig-iron.—£15 15s. 6d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots).—40/55 per cent., £40 15s. 0d., basis 45 per cent. Si, scale 15s. per unit; 70/84 per cent., £63 0s. 0d., basis 75 per cent. Si, scale 16s. per unit.

Ferro-vanadium.—50/60 per cent., 23s. 8d. to 25s. 0d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 11s. 0d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £161 0s. 0d. to £165 0s. 0d. per ton; 38/40 per cent., £258 0s. 0d. to £262 0s. 0d. per ton.

Ferro-tungsten.—80/85 per cent., 14s. 9d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 17s. 9d. per lb. of W.

Ferro-chrome (6-10 ton lots).—4/6 per cent. C, £80 0s. 0d. to £82 0s. 0d., basis 60 per cent. Cr, scale 25s. 0d. per unit; over 6 per cent. C, £78 0s. 0d. to £80 0s. 0d., basis 60 per cent. Cr, scale 24s. 0d. per unit; 2 per cent. C,* 1s. 10d. per lb. Cr; 1 per cent. C,* 1s. 11d. per lb. Cr; 0.15 per cent. C,* 1s. 11d. to 2s. 1d. per lb. Cr; 0.10 per cent. C,* 1s. 11d. to 2s. 2d. per lb. Cr; 0.06 per cent. C,* 2s. 3d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 7½d. to 7s. 1d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £225 0s. 0d. to £232 0s. 0d. per ton; 96/98 per cent., £259 0s. 0d. to £265 0s. 0d. per ton.

Ferro-columbium.—60/75 per cent., Nb + Ta, 52s. 6d. to 70s. 0d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £53 17s. 6d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £25 5s. 0d.; tested, 0.08 to 0.25 per cent. C, £26 5s. 0d.; hard (0.41 to 0.60 per cent. C), £27 10s. 0d.; silico-manganese, £34 10s. 0d.; free-cutting, £29 6s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £32 17s. 0d.; silico-manganese, £34 10s. 0d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 13s. 6d.; basic, hard, over 0.41 up to 0.60 per cent., C, £30 16s. 0d.; acid, up to 0.25 per cent. C, £33 15s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £31 1s. 6d.; boiler plates (N.-E. Coast), £33 11s. 6d.; fire plates (N.-E. Coast), £32 10s. 6d.; sectional material, N.-E. Coast, £29 4s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £31 19s. 6d.; flats, 5 in. wide and under, £31 19s. 6d.; hoop and strip, £33 1s. 6d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £34 5s. 0d.; black sheets (hand mill), 17/20 g., £43 13s. 6d.; galvanized corrugated sheets, 24 g., £55 4s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £54 7s. 0d.; nickel-chrome, £76 7s. 9d.; nickel-chrome-molybdenum, £86 8s. 6d.

NON-FERROUS METALS

Copper.—Cash, £328 0s. 0d. to £329 0s. 0d.; three months, £318 10s. 0d. to £319 0s. 0d.; settlement, £329 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 3s. 2½d. per lb.; rods, 375s. 6d. per cwt. basis; 20 s.w.g., 406s. 9d. per cwt.

Tin.—Cash, £717 10s. 0d. to £718 10s. 0d.; three months, £718 10s. 0d. to £719 0s. 0d.; settlement, £718 10s. 0d.

Lead (Refined Pig).—Second half April, £104 15s. 0d. to £105 0s. 0d.; second half July, £104 15s. 0d. to £105 0s. 0d.

Zinc.—Second half April, £89 0s. 0d. to £89 10s. 0d.; second half July, £87 15s. 0d. to £88 0s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £120 15s. 0d.; rolled zinc (boiler plates), all English destinations, £118 10s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £103 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 2s. 6⅝d. per lb.; rods, drawn, 3s. 4¾d.; sheets to 10 w.g., 332s. 6d. per cwt.; wire, 3s. 2d.; rolled metal, 318s. 3d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £209; B6 (85/15), £305; BS249, —

Brass (High Tensile).—BS1400, HTB1 (30 tons), £263; HTB2 (38 tons), £277; HTB3 (48 tons), £285.

Gunmetal.—RCH, 3/4 per cent. tin, —; BS1400, LG2 (85/5/5/5), £286; LG3 (86/7/5/2), £299; G1 (88/10/2/½), £379; (88/10/2/1), £366.

Phosphor Bronze.—BS1400, PB1 (AID released), £388 per ton.

Phosphor Bronze Strip, etc.—Strip, 462s. 9d. per cwt.; sheets to 10 w.g., 486s. 3d. per cwt.; wire, 4s. 8⅝d. per lb.; rods, 4s. 1½d.; tubes, 3s. 11¾d.; chill cast bars: solids 4s. 0d., cored 4s. 1d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 9½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 2¾d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 1¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 3d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £108 10s. 0d. to £109 0s. 0d. Nickel, £519 0s. 0d. Aluminium, ingots, £163 0s. 0d.; aluminium bronze (BS1400), AB1, £342; AB2, £350. Solder, brazing, BS1845, 2s. 9d. lb.; granulated, 3s. 0d. lb.